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ABSTRACT

This packet contains an instructor guide and student reference for a course in introduction to animal products. The curriculum contains the following six lessons: (1) importance of animal products; (2) beef; (3) pork; (4) lamb and mutton; (5) poultry products; and (6) dairy products. The instructor guide includes the following: objectives, competencies, motivational techniques, teaching procedures, other activities, activity sheets, transparency masters, evaluations, answers to evaluations and activity sheets, references and teaching aids, and materials and equipment lists. For ease of use, the guide includes competencies and objectives at the beginning of the guide as well as incorporated within each lesson. A competency profile is provided in the front of the guide for convenient recordkeeping. Fourteen references are listed. The guide incorporates the needed components to aid agriculture teachers to implement Vocational Instructional Management System (VIMS), a framework to use in planning and organizing to ensure excellence in Missouri's vocational education system by focusing greater attention on the management of teaching and learning. The student reference contains information sheets and summaries for each of the lessons. (KC)

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ED 419 926

Introduction to Animal Products
Instructor Guide
Student Reference

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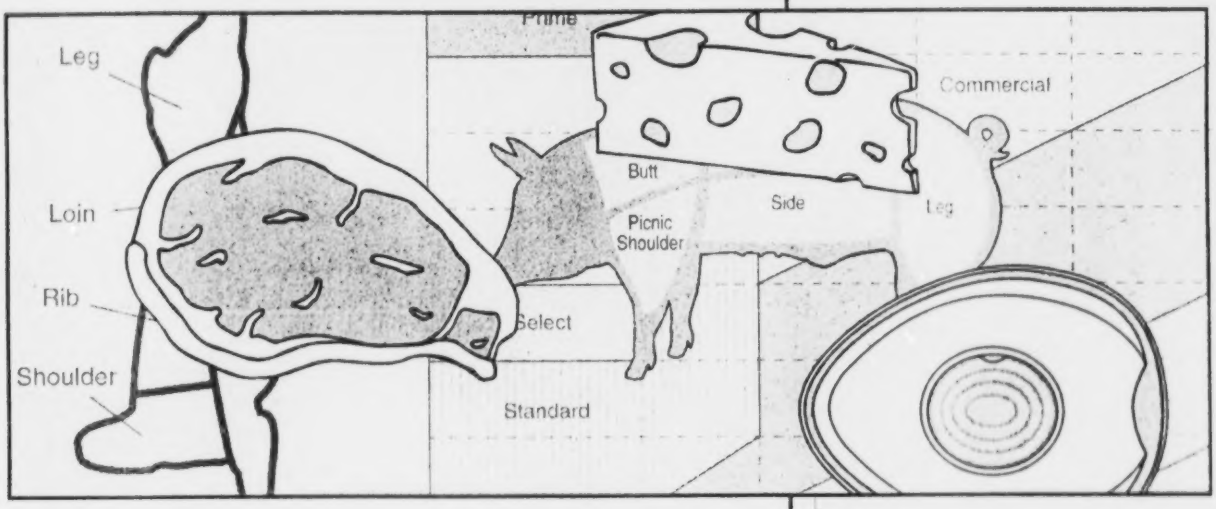
Introduction to

ANIMAL PRODUCTS

instructor guide



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Jefferson City, Missouri

MISSOURI AGRICULTURAL EDUCATION

Instructional Materials Laboratory
University of Missouri-Columbia

Instructor Guide

INTRODUCTION TO ANIMAL PRODUCTS

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FOREWORD

The development of the *Introduction to Animal Products* curriculum guide is the result of suggestions by the MVATA Teaching Aids Committee. The Animal Products Advisory Committee suggested the topics to be included and reviewed the materials. In addition several technical experts reviewed the materials for content accuracy.

This curriculum contains six lessons: importance of animal products, beef, pork, lamb and mutton, poultry products, and dairy products. The instructor guide includes objectives, competencies, motivational techniques, teaching procedures, other activities, activity sheets, transparency masters, evaluations, answers to evaluations and activity sheets, references and teaching aids, and materials and equipment. One copy of the student reference is packaged with the instructor guide. Additional copies of the student reference can be purchased separately.

During the summer of 1981, the Missouri State Board of Education formally adopted the concept of "Instructional Management Systems" (IMS) as a priority for the 1981-82 school year. The Missouri Commissioner of Education described the IMS concept as a practical way of "organizing for excellence" in education. To meet the demand for greater productivity and accountability, the director of Vocational Education applied the elements of IMS to form the Vocational Instructional Management System (VIMS). The VIMS process provides a framework to use in planning and organizing to assure excellence in Missouri's vocational education system by focusing greater attention on the management of teaching and learning.

This guide incorporates the needed components to aid agriculture teachers in the implementation of VIMS. For ease of use, competencies/objectives have been included at the beginning of the guide as well as incorporated within each lesson. A competency profile has been provided in the front of the guide for convenient record keeping.

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INTRODUCTION TO ANIMAL PRODUCTS

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COMPETENCIES/OBJECTIVES

1. Describe the importance of animal products.
2. Describe beef carcass fabrication and grading.
3. Describe pork carcass fabrication and grading.
4. Describe ovine carcass fabrication and grading.
5. Identify and grade poultry products.
6. Identify and describe types of dairy products.

EVALUATION

1. Give short, objective tests following each lesson and a more in-depth objective test at the conclusion of the unit.

2. Observe the changes in behavior as evidence of the improved ability of students to deal with problems in this unit using backgound information acquired from earlier units.

3. Observe students' attempts to solve similar problems in their supervised agricultural experience programs.

REFERENCES AND MATERIALS

1. Student Reference

   Introduction to Animal Products (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1998.

2. Teacher References

   a. Books

      1) Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kindall/Hunt Publishing Company, 1993.

      2) Ermis, Larry. *Poultry Science Manual for National FFA Career Development Events.* College Station, TX: Instructional Materials Service, 1995.

      3) Martin, Phillip. *Food Science and Technology.* University of Missouri-Columbia: Instructional Materials Laboratory, 1994.

      4) *Meat Evaluation Handbook.* Chicago: National Livestock and Meat Board, 1988.

      5) *Procedures to Evaluate Market Hogs.* 3rd ed. Des Moines: National Pork Producers Council, 1991.

   b. Pamphlets, magazines, etc.

      1) *Purchasing Pork: A Consumer Guide to Identifying Retail Pork Cuts (poster).* National Pork Producers Council in Cooperation with the National Pork Board, 1997.

      2) United States Department of Agriculture. Agricultural Marketing Service. Livestock and Seed Division. *United States Standard for Grades of Carcass Beef.* (Effective January 31, 1997.)

      3) United States Department of Agriculture. Agricultural Marketing Service. Livestock and Seed Division. *United States Standards for Grades of Lamb, Yearling Mutton, and Mutton Carcasses.* (Effective July 6, 1992.)

      4) United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Grading of Shell Eggs* (7 CFR Part 56) Effective May 1, 1997, and *United States Standards, Grades, and Weight Classes for Shell Eggs* (AMS 56) Effective April 6, 1995. Washington, DC.

      5) United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

6) United States Department of Agriculture. National Agricultural Statistics Service. *Ag Statistics 95-96*. Washington, DC.

c. Internet resources

1) United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. Grading Branch. "USDA AMS Poultry Grading and Certification." http://www.ams.usda.gov/poultry/pygrd.htm (15 September 1997).

2) United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. Grading Branch. "USDA AMS Shell Egg Grading and Certification." http://www.ams.usda.gov/poultry/pyshegg.htm (15 September 1997).

3) United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. Standardization Branch. "USDA AMS Quality Standards."' http://www.ams.usda.gov/poultry/pystand.htm (15 September 1997).

Introduction to Animal Products
Competency Profile

Directions: Evaluate the student by checking the appropriate number or letter to indicate the degree of competency. The rating for each task should reflect **employability readiness** rather than the grades given in class.

Rating Scale:
3 Mastered - can work independently with no supervision
2 Requires Supervision - can perform job completely with limited supervision
1 Not Mastered - requires instruction and close supervision
N No Exposure - no experience or knowledge in this area

3	2	1	N

Introduction to Animal Products

1. Describe the importance of animal products
2. Describe beef carcass fabrication and grading
3. Describe pork carcass fabrication and grading
4. Describe ovine carcass fabrication and grading
5. Identify and grade poultry products
6. Identify and describe types of dairy products

Other:_____

_____

Introduction to Animal Products

Student Names														

Competencies

1. Describe the importance of animal products.
2. Describe beef carcass fabrication and grading.
3. Describe pork carcass fabrication and grading.
4. Describe ovine carcass fabrication and grading.
5. Identify and grade poultry products.
6. Identify and describe types of dairy products.

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 1: Importance of Animal Products

Competency/Objective: Describe the importance of animal products.

Study Questions

1. **How has the animal processing industry evolved?**
2. **What are the career opportunities related to animal processing?**
3. **What is the economic importance of animal processing?**
4. **How does processing affect the value of the product?**

References

1. *Introduction to Animal Products (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1998.
2. Activity Sheet
   a) AS 1.1: A Career in the Animal Processing Industry

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 1: Importance of Animal Products

TEACHING PROCEDURES

A. Introduction

The animal processing industry is a complex, multi-billion dollar industry which processes beef, dairy, sheep, swine, and poultry products. There are many rewarding careers associated with the animal processing industry.

B. Motivation

Bring a food sample to class such as an egg, a carton of milk, or a piece of meat, and discuss how the product was made ready for the consumer.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the students how the animal processing industry has evolved. List answers on the board or overhead. Bring the legislative acts into the discussion and discuss the current role of the USDA.

How has the animal processing industry evolved?

a) Evolved into large corporations that utilize the entire animal in some manner
b) Animal processing started in small privately-owned facilities.
c) Legislative acts have helped bring consistency and safety to the animal processing industry.
    1) Meat Inspection Act of 1906
        (a) Began federal meat inspection
        (b) USDA control
    2) Packers and Stockyards Act of 1921
        (a) Prevents unfair business dealings of packers/stockyards
        (b) Initiated scale testing in sale barns and packing facilities
    3) Wholesome Meat Act of 1967 - Make state inspection similar to federal inspection
    4) Today, food inspection is under the USDA's Food Safety and Inspection Service.

2. Ask the class to list careers associated with animal processing. Have students complete AS 1.1, A Career in the Animal Processing Industry. Stress that there are countless opportunities for careers in the animal processing field.

What are the career opportunities related to animal processing?

a) Livestock buyers - purchase animals for processing company
b) Federal inspectors - insure that food is safe and wholesome, USDA
c) USDA meat graders - assign quality and yield grades to meat carcasses
d) Quality control supervisors - supervise employees and ensure quality finished products
e) Butcher - cut carcasses into retail and wholesale cuts; also process animals

3. Have the students list the dollar amount associated with animal processing. List the amount on the board or overhead.

What is the economic importance of animal processing?

a) Over 358 billion dollars worth of meat, dairy, and poultry products sold in 1994
b) Plus, additional income from animal by-products

4. Ask the students how food costs are affected by the business structure of the animal processing industry. Discuss convenience food such as microwave-ready and ready-to-eat products.

How does processing affect the value of the product?

The more processing involved, the higher the cost of the end product will be.

F. Other Activities

1. Conduct a more detailed research project on the early history of the animal processing industry.

2. List the major animal processing companies in America, and research their annual sales figures.

G. Conclusion

The animal processing industry is a large, complex multi-billion dollar industry. There are many different careers in the animal processing industry. The more processing the raw product receives, the higher the cost of the end product.

H. Answers to Activity Sheet

I. Answers to Evaluation

1. d
2. b
3. a
4. Livestock buyer, federal inspectors, USDA grader, quality control supervisor, food inspector
5. Any microwave-ready and ready-to-eat product (e.g., chicken nuggets)

UNIT - INTRODUCTION TO ANIMAL PRODUCTS Name _____

Lesson 1: Importance of Animal Products Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. When was the Meat Inspection Act passed?

   a. 1980
   b. 1967
   c. 1921
   d. 1906

2. Which act made state and federal food inspection similar?

   a. Meat Inspection Act
   b. Wholesome Meat Act
   c. Packers and Stockyards Act
   d. Safe Food Act

3. How many dollars worth of meat, dairy, and poultry products were sold in 1994?

   a. Over 358 million
   b. Over 100 billion
   c. Over 358 billion
   d. Over 100 trillion

Complete the following short answer questions.

4. List two careers associated with animal processing.

5. List an example of a value-added product.

Lesson 1: Importance of Animal Products Name _____

A Career in the Animal Processing Industry

Objective: Learn more about the animal processing industry by conducting an interview with someone in a career related to the industry.

Interview a person with a career in the animal processing industry. Record his or her name, occupation, and place of employment. Use the questions on this sheet as an aid during the interview. Write down the answers to the questions, as well as any other information that is important. Then, report about the career to the class.

Name:

Occupation:

Place of Employment:

How long have you worked in your present occupation?

How did you choose this career?

What training was necessary for this job?

What professional skills do you use?

What jobs have you had previously that helped prepare you for this one?

What other jobs have you considered?

What are your career plans for the future?

What advice would you give someone who is considering a career in this area?

Comments:

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 2: Beef

Competency/Objective: Describe beef carcass fabrication and grading.

Study Questions

1. **How is the quality grade of a beef carcass determined?**
2. **How is the yield grade of a beef carcass determined?**
3. **What are the wholesale cuts of beef?**
4. **What are the retail cuts of beef?**

References

1. *Introduction to Animal Products (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1998.
2. Transparency Masters
   a) TM 2.1: Quality Grading
   b) TM 2.2: Wholesale Cuts of Beef

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 2: Beef

TEACHING PROCEDURES

A. Review

Lesson 1 discussed the animal processing industry. The animal processing industry is a large multi-billion dollar industry. This lesson will focus on quality and yield grading and the wholesale and retail cuts of beef.

B. Motivation

Obtain a retail cut identification slide set or flash card set, and show the class a retail cut of beef and have the students try to identify the cut.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the students how a beef carcass is quality graded. Explain that the quality grade indicates the palatability of the beef. Describe the difference between maturity and marbling. Use TM 2.1 as a guide to quality grading.

How is the quality grade of a beef carcass determined?

a) Marbling and muscle firmness are evaluated in the rib eye muscle between the 12th and 13th rib.
   1) Marbling is intramuscular fat.
   2) There are ten degrees of marbling. The first three only apply in carcass evaluation programs and for other purposes.
      (a) Very abundant
      (b) Abundant
      (c) Moderately abundant
      (d) Slightly abundant
      (e) Moderate
      (f) Modest
      (g) Small
      (h) Slight
      (i) Traces
      (j) Practically devoid
   3) Firmness of muscle
      (a) Firmness of muscle ranges from very soft and watery to firm.
      (b) Standards spell out what is required for each quality grade.

b) Maturity (age of carcass) is determined.
   1) 5 degrees A - E
   2) "A" maturity is usually young cattle less than 30 months of age.

c) Marbling, muscle firmness, and maturity interact to determine the quality grade. It is assumed that when using the USDA quality grade table that firmness of lean is comparably developed with the degree of marbling.

d) The quality grades for steer and heifer beef are listed below.
   1) Prime

2) Choice
3) Select
4) Standard
5) Commercial
6) Utility
7) Cutter
8) Canner

e) The quality grades for cow beef are listed below.
1) Choice
2) Select
3) Standard
4) Commercial
5) Utility
6) Cutter
7) Canner

f) The quality grades for bullock beef are listed below.
1) Prime
2) Choice
3) Select
4) Standard
5) Commercial
6) Utility

2. Ask the students to define a yield grade. Yield grades identify the amount of saleable meat obtained from the carcass as boneless trimmed retail cuts from the round, loin, rib, and chuck. Next, have the students list the factors that influence yield grade on the board. Describe how a yield grade is determined.

How is the yield grade of a beef carcass determined?

a) Yield grades are a numerical score from 1-5.
1) Yield grade of 1 has the highest percentage of saleable meat.
2) Yield grade of 5 has the lowest percentage of saleable meat

b) Yield grades are determined by evaluating four factors.
1) External fat
2) Kidney, pelvic, and heart fat
3) Rib eye area
4) Hot carcass weight

3. Discuss with students the difference between a wholesale cut and a retail cut. Use TM 2.2 as a guide for discussion.

What are the wholesale cuts of beef?

a) Chuck
b) Rib
c) Short loin
d) Sirloin
e) Round
f) Flank
g) Short plate
h) Brisket
i) Fore shank
j) Variety meats

4. Ask the students what retail cuts come from each of the wholesale cuts of beef. Use a retail cut identification slide set or flash cards if available as an aid in retail cut identification.

What are the retail cuts of beef?

a) Chuck
   1) Arm pot roast
   2) Blade pot roast
   3) Cross rib pot roast
   4) Chuck eye roast
   5) Seven bone roast
   6) Flanken-style ribs
   7) Under blade pot roast
   8) Short ribs
   9) Mock tender
   10) Boneless shoulder pot roast
   11) Boneless top blade steak

b) Rib
   1) Rib roast large end
   2) Rib roast small end
   3) Rib steak
   4) Rib eye steak
   5) Rib eye roast
   6) Back ribs

c) Short loin
   1) Porterhouse steak
   2) T-bone steak
   3) Boneless top loin steak
   4) Tenderloin steak and roast

d) Sirloin
   1) Sirloin steak, round bone
   2) Sirloin steak, flat bone
   3) Top sirloin steak

e) Round
   1) Round steak
   2) Top round steak and roast
   3) Bottom round roast
   4) Eye round roast
   5) Tip roast, cap off
   6) Tip steak
   7) Boneless rump roast

f) Flank
   1) Flank steak
   2) Flank steak rolls

g) Short plate
   1) Skirt steak

h) Brisket
   1) Brisket whole
   2) Brisket flat half
   3) Corned brisket, point half

i) Shank
   1) Shank cross cuts

j) Other cuts
   1) Beef for stew
   2) Cubes for kabobs
   3) Cubed steak

4) Ground beef

k) Variety meats
   1) Heart
   2) Tongue
   3) Liver
   4) Kidney
   5) Tripe
   6) Brains
   7) Sweetbreads

F. Other Activities

1. Visit a local grocery store or meat locker, and look at the various wholesale and retail cuts that are available.

2. Schedule a visit to a beef processor, and watch a carcass being cut into wholesale and retail cuts.

G. Conclusion

Beef carcasses are graded for quality, which refers to palatability, and yield, which is the amount of boneless, closely trimmed retail cuts from the round, loin, rib, and chuck. Wholesale cuts of beef are cut into retail cuts that are sold to consumers. Some retail cuts come from more than one wholesale cut or from other areas of the beef.

H. Answers to Activity Sheet - no activity sheet

I. Answers to Evaluation

1. c
2. d
3. a
4. a
5. c

6. Intramuscular

7. External fat thickness; hot carcass weight; amount of kidney, pelvic, and heart fat; and rib eye area

UNIT - INTRODUCTION TO ANIMAL PRODUCTS Name _____

Lesson 2: Beef Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Marbling, muscle firmness, and _____ determines beef quality grade.

   a. Hot carcass weight
   b. Internal fat
   c. Maturity
   d. Rib eye area

2. Porterhouse steak comes from which wholesale cut?

   a. Chuck
   b. Flank
   c. Fore shank
   d. Short loin

3. Which of the following is <u>not</u> a wholesale cut of beef?

   a. T-bone
   b. Sirloin
   c. Round
   d. Short plate

4. Which of the following retail cuts comes from the chuck?

   a. Arm roast
   b. Round roast
   c. Rib eye steak
   d. Sirloin steak

5. The beef cow is <u>not</u> eligible for which quality grade?

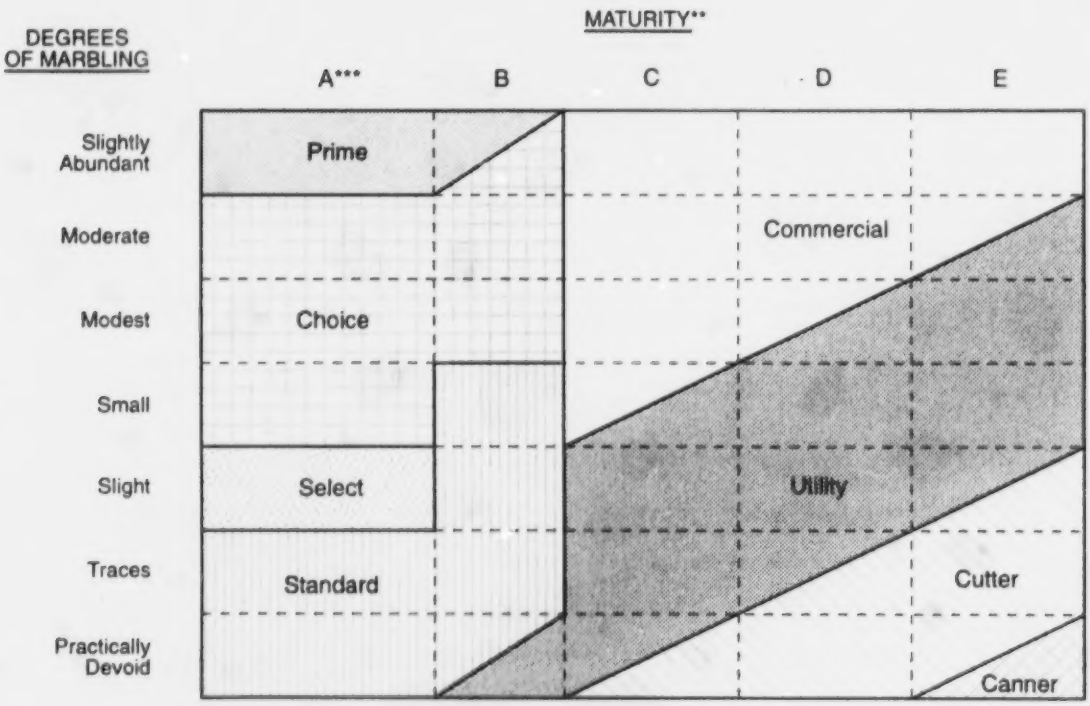
   a. Canner
   b. Choice
   c. Prime
   d. Standard

Complete the following short answer questions.

6. Marbling is what type of fat?

7. List the factors that determine the yield grade of a beef carcass.

Quality Grading*

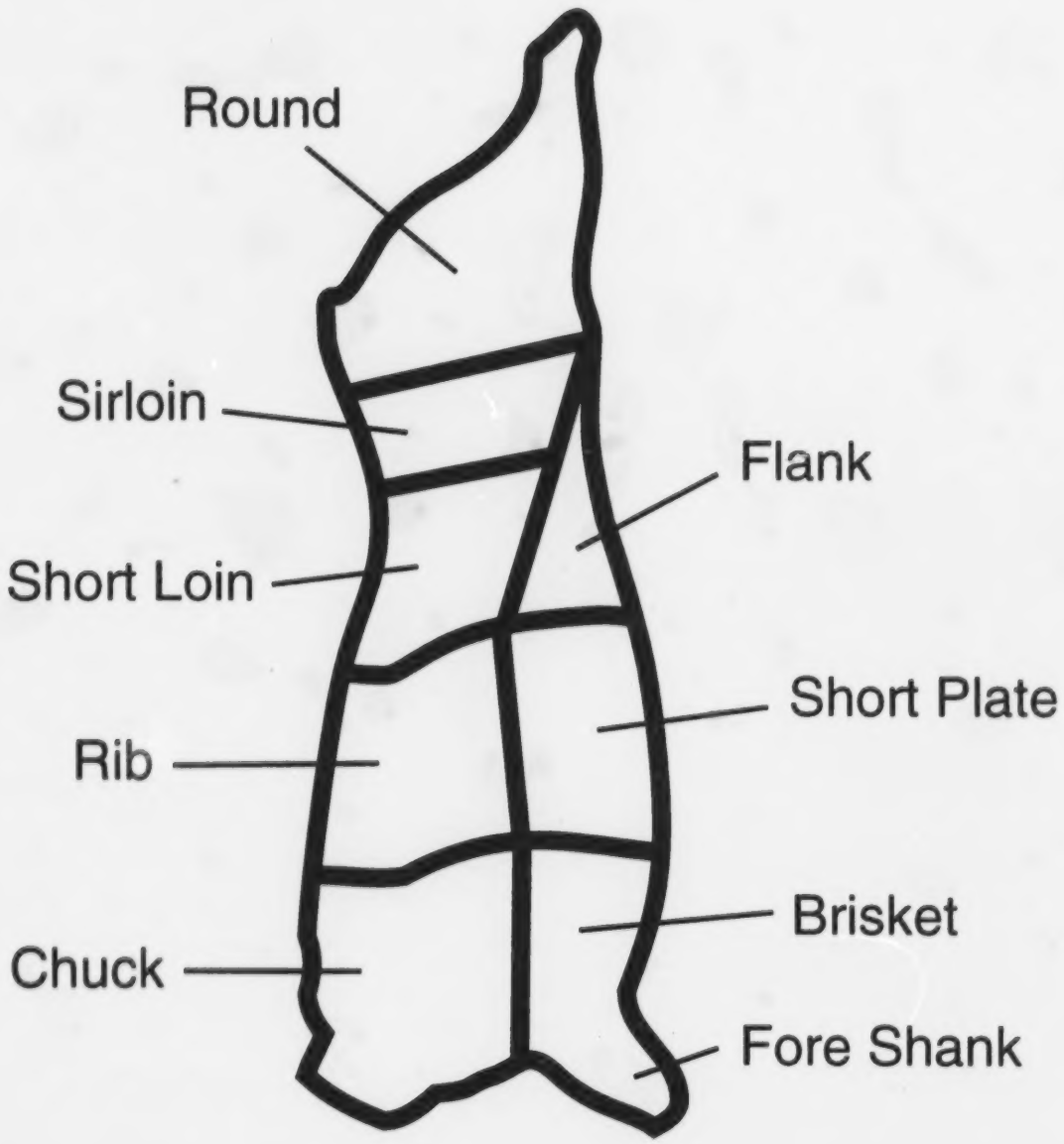


* Assumes that firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter."

** Maturity increases from left to right (A through E).

*** The A maturity portion of the Figure is the only portion applicable to bullock carcasses.

Wholesale Cuts of Beef



UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 3: Pork

Competency/Objective: Describe pork carcass fabrication and grading.

Study Questions:

1. **What are the quality characteristics of pork?**
2. **How is the amount of saleable product determined?**
3. **What are the wholesale cuts of pork?**
4. **What are the retail cuts of pork?**

References

1. *Introduction to Animal Products (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1998.
2. Transparency Masters
   a) TM 3.1: Calculating Percent Muscle
   b) TM 3.2: Wholesale Cuts of Pork
3. Activity Sheet
   a) AS 3.1: Calculating Percent Muscle

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 3: Pork

TEACHING PROCEDURES

A. Review

In Lesson 2, beef quality and yield grading were discussed as well as the wholesale and retail cuts of beef. Lesson 3 will concentrate on calculating the percent muscle of a pork carcass as well as identifying the wholesale and retail cuts of pork.

B. Motivation

Obtain an actual retail cut of pork or a slide or flash card of a cut, and have the students attempt to guess the cut.

C. Assignment

D. Supervised Study

E. Discussion

1. Discuss the characteristics of pork that are evaluated for quality. Explain that unlike beef that receives a quality grade, these characteristics are evaluated to determine pork quality but no "grade" is assigned.

What are the quality characteristics of pork?

a) Muscle color - There are five color scores, with reddish pink being the ideal color. For carcasses scoring 1 or 5, it is recommended that they be eliminated from consideration.
   1) 1 = Pale pinkish gray
   2) 2 = Grayish pink
   3) 3 = Reddish pink
   4) 4 = Purplish red
   5) 5 = Dark purplish red

b) Muscle firmness/wetness condition - It is recommended that carcasses scoring 1 or 2 be eliminated from consideration.
   1) 1 = Very soft and very watery
   2) 2 = Soft and watery
   3) 3 = Slightly firm and moist
   4) 4 = Firm and moderately dry
   5) 5 = Very firm and dry

c) Marbling (intramuscular fat) - Scores from 2 to 4 are considered desirable. Carcasses scoring a 1 or 5 should be eliminated from consideration.
   1) 1 = Devoid to practically devoid
   2) 2 = Traces to slight
   3) 3 = Small to modest
   4) 4 = Moderate to slightly abundant
   5) 5 = Moderately abundant or greater

d) Other tissue conditions - If either of the following conditions are evident, the carcass is eliminated from consideration.
   1) Steatosis - It is a fatty infiltration in muscle area caused by problems such as muscle atrophy.

2) Soft, oily fat - This fat is unattractive and is likely to turn rancid during processing and storage.

2. Ask students how the amount of saleable product is determined on a pork carcass. List the factors that go into calculating the percent muscle of a pork carcass. Explain the concept of paying premiums for carcasses over 50 percent muscle and docking the purchase price for carcasses under 50 percent muscle. Activity Sheet 3.1 provides student practice in calculating percent muscle of a carcass. Use TM 3.1 as a guide in explaining percent muscle calculation.

How is the amount of saleable product determined?

By calculating percent of muscle or percent lean of a pork carcass
a) Hot carcass weight in pounds (HCW)
b) Backfat measurement at the 10th rib
c) Loin muscle area at the 10th rib (LMA)
d) Percent muscle equation

$$\frac{88.307 - (.036 \times HCW) - (18.574 \times 10th\ rib\ backfat) + (3.734 \times LMA)}{170} \times 100 = \%\ muscle$$

3. Ask students what are the wholesale cuts of pork. Use TM 3.2 as a guide for discussion of the question.

What are the wholesale cuts of pork?

a) Shoulder butt
b) Picnic shoulder
c) Loin
d) Leg
e) Side (Belly)

4. Use teaching aids such as the retail meat cut identification flash cards available from IML and the poster available from the Missouri Pork Producers Association in discussion of what retail cuts of pork are fabricated (made) from the wholesale cuts. Explain to the class that pork cuts can be fresh or smoked/cured, which adds flavor.

What are the retail cuts of pork?

a) Leg
   1) Bone-in fresh ham
   2) Smoked ham
   3) Fresh ham roast, boneless
   4) Leg cutlets
b) Loin
   1) Boneless center loin roast
   2) Bone-in sirloin roast
   3) Boneless sirloin roast
   4) Center rib roast
   5) Rib chop
   6) Tenderloin
   7) Back ribs
   8) Boneless rib end roast
   9) Country-style ribs
   10) Boneless rib end chop
   11) Canadian style bacon
   12) Sirloin chop

13) Boneless center loin chop
14) Butterfly chop
15) Loin chop

c) Shoulder butt
1) Bone in blade roast
2) Boneless blade roast
3) Ground pork
4) Sausage
5) Blade steak

d) Picnic shoulder
1) Smoked picnic
2) Arm picnic roast
3) Smoked hocks

e) Side
1) Sliced bacon
2) Spareribs
3) Slab bacon

f) Variety meats
1) Tongue
2) Heart
3) Sweet breads
4) Brains
5) Liver
6) Kidney

F. Other Activities

How do methods of preparation influence the palatability and enjoyment of pork when it is consumed? Evaluate effect of end point temperature on juiciness, tenderness, and flavor. Compare tenderloin or loin chop with blade steak and/or spareribs.

G. Conclusion

The quality of pork carcasses is determined by evaluating muscle color, muscle firmness/wetness, marbling, and other tissue conditions. Pork carcasses are valued on a cutability basis using the percent muscle or percent lean formula. The formula uses hot carcass weight, average backfat measurement, and loin muscle area. Pork carcasses are then cut into wholesale and retail cuts and sold to consumers as fresh or cured pork.

H. Answers to Activity Sheet

1. $$\frac{88.307 - (.036 \times 167) - (18.574 \times .8) + (3.734 \times 5.0)}{170} \times 100 = 50.7\% \textit{ muscle}$$

2. $$\frac{88.307 - (.036 \times 166) - (18.574 \times .7) + (3.734 \times 4.8)}{170} \times 100 = 51.3\% \textit{ muscle}$$

3. $$\frac{88.307 - (.036 \times 187) - (18.574 \times .9) + (3.734 \times 7.5)}{170} \times 100 = 54.7\% \textit{ muscle}$$

4. $$\frac{88.307 - (.036 \times 194) - (18.574 \times 1.1) + (3.734 \times 6.8)}{170} \times 100 = 50.8\% \textit{ muscle}$$

5. $\frac{88.307 - (.036 \times 184) - (18.574 \times .6) + (3.734 \times 5.5)}{170} \times 100 = 53.6\%$ *muscle*

6. $\frac{88.307 - (.036 \times 179) - (18.574 \times .5) + (3.734 \times 7.0)}{170} \times 100 = 58.1\%$ *muscle*

7. $\frac{88.307 - (.036 \times 173) - (18.574 \times .9) + (3.734 \times 8.7)}{170} \times 100 = 57.6\%$ *muscle*

8. $\frac{88.307 - (.036 \times 174) - (18.574 \times 1.2) + (3.734 \times 6.0)}{170} \times 100 = 48.3\%$ *muscle*

9. $\frac{88.307 - (.036 \times 172) - (18.574 \times 1.0) + (3.734 \times 4.3)}{170} \times 100 = 46.8\%$ *muscle*

10. $\frac{88.307 - (.036 \times 198) - (18.574 \times .9) + (3.734 \times 9.0)}{170} \times 100 = 57.7\%$ *muscle*

I. Answers to Evaluation

1. a
2. c
3. b
4. d
5. a
6. b
7. d

UNIT - INTRODUCTION TO ANIMAL PRODUCTS Name _____

Lesson 3: Pork Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which retail cut is from the shoulder butt?

   a. Boneless blade roast
   b. Canadian-style bacon
   c. Leg cutlets
   d. Smoked picnic

2. From which wholesale cut of pork is a rib chop cut?

   a. Butt shoulder
   b. Leg
   c. Loin
   d. Side

3. The back ribs come from which wholesale cut of pork?

   a. Leg
   b. Loin
   c. Shoulder picnic
   d. Side

4. Which retail cut is from the side?

   a. Back ribs
   b. Canadian-style bacon
   c. Sirloin roast
   d. Spareribs

5. Where are the back fat and loin muscle area measurements taken for percent muscle calculations?

   a. 10th rib
   b. 12th rib
   c. Front shoulder
   d. Loin

6. Back fat measurement and loin muscle area are two of the factors in the percent muscle equation. What is the third factor?

   a. Depth of ribeye
   b. Hot carcass weight
   c. Market weight
   d. Sex of animal

7. What factors are considered in evaluating the quality of a pork carcass?

a. Maturity, marbling, flank streakings, and other tissue conditions
b. Maturity, muscle firmness, muscle color, and loin muscle area
c. Marbling, muscle color, other tissue conditions, and loin muscle area
d. Marbling, muscle color, muscle firmness, and other tissue conditions

Calculating Percent Muscle

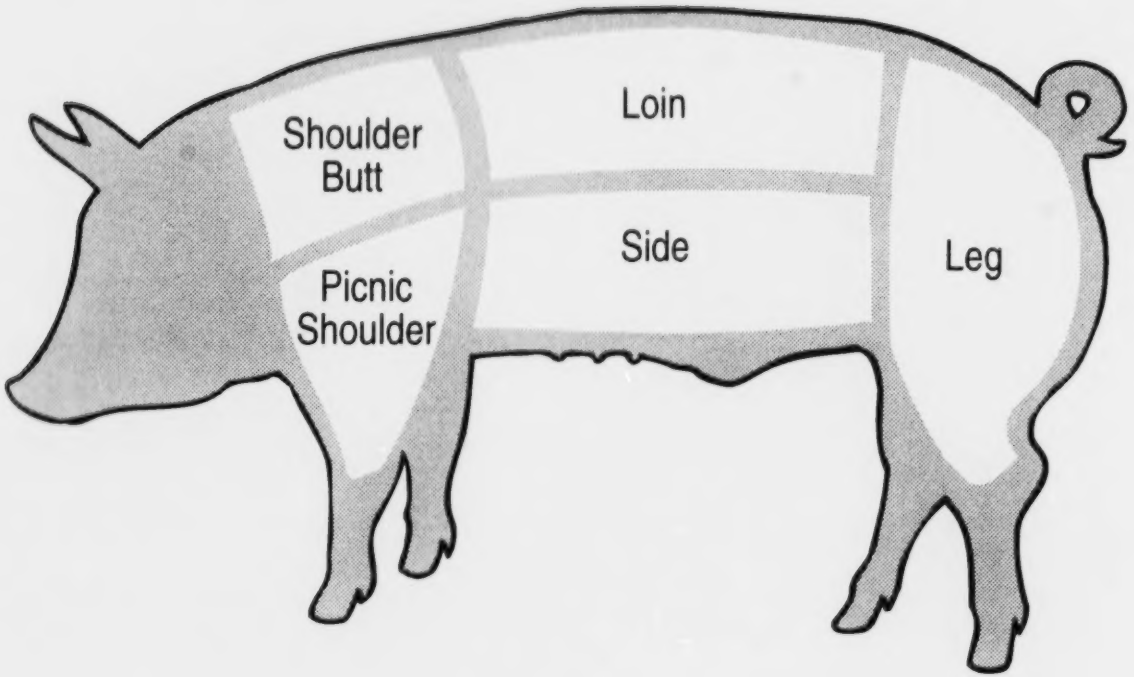
Percent muscle/percent lean of a pork carcass is adjusted to a 170 pound carcass weight.

Factors involved:

1. Hot carcass weight - HCW
2. Backfat at 10th rib (Tenths of an inch)
3. Loin muscle area 10th rib (square inches) - LMA

$$\frac{88.307 - (.036 \times \text{HCW}) - (18.574 \times \text{10th rib backfat}) + (3.734 \times \text{LMA})}{170} \times 100 = \%\ \text{muscle}$$

Wholesale Cuts of Pork



Lesson 3: Pork Name _____

Calculating Percent Muscle

Calculate the percent muscle for the following carcasses. Use the formula shown below: (round to nearest tenth). Use the space below to show your work.

$$\frac{88.307 - (.036 \times HCW) - (18.574 \times 10th\ rib\ backfat) + (3.734 \times LMA)}{170} \times 100 = \%\ muscle$$

HCW = Hot carcass weight (pounds)
LMA = Loin muscle area (square inches)

	HCW	10th Rib Backfat Measurement	LMA	Percent Muscle
1.	167	.8	5.0	
2.	166	.7	4.8	
3.	187	.9	7.5	
4.	194	1.1	6.8	
5.	184	.6	5.5	
6.	179	.5	7.0	
7.	173	.9	8.7	
8.	174	1.2	6.0	
9.	172	1.0	4.3	
10.	198	.9	9.0	

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 4: Lamb and Mutton

Competency/Objective: Describe ovine carcass fabrication and grading.

Study Questions

1. **How is the quality grade of an ovine carcass determined?**
2. **How is the yield grade of an ovine carcass determined?**
3. **What are the wholesale cuts of lamb and mutton?**
4. **What are the retail cuts of lamb and mutton?**

References

1. *Introduction to Animal Products (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1998.
2. Transparency Masters
   a) TM 4.1: Ovine Carcass Quality Grading
   b) TM 4.2: Wholesale Cuts of Ovine Carcasses
3. Activity Sheet
   a) AS 4.1: Ovine Carcass Yield Grading

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 4: Lamb and Mutton

TEACHING PROCEDURES

A. Review

Lesson 3 centered on pork grading as well as the wholesale and retail cuts of pork. In Lesson 4, lamb quality and yield grading as well as the wholesale and retail cuts of lamb will be discussed.

B. Motivation

Obtain an actual retail cut of lamb or a slide or flash card of a cut, and have students attempt to guess which cut it is.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the students what determines the quality grade of an ovine carcass. Use TM 4.1 as a guide in discussion of question 1. Explain the differences in maturity and flank streakings.

How is the quality grade of an ovine carcass determined?

a) Maturity - age
   1) Lamb (young lamb and older lamb)
      (a) Have break joints on at least one front shank
      (b) Slightly wide and moderately flat ribs; wider as lamb ages
      (c) Dark pink to light red lean; fine-textured lean
   2) Yearling mutton
      (a) Either break or spool joints on their front shanks
      (b) Wider and flatter ribs
      (c) Slightly dark red lean; slightly coarse-textured
   3) Mutton
      (a) Spool joints on their front shanks
      (b) Wide, flat rib bones
      (c) Dark red lean; coarse-textured

b) Flank streaking - the amount of fat streaks within and upon the inside of the flank of the carcass
   1) As flank streaking increases, palatability also increases
   2) Ten degrees of flank streaking

c) Final quality grade is determined by combining maturity and degree of flank streaking
   1) Prime
   2) Choice
   3) Good
   4) Utility
   5) Cull (mutton only)

2. Ask the students how the yield grade of an ovine carcass is determined. Write the formula on the board or overhead. Explain that ovine carcass yield grades are based primarily on the amount of backfat or external fat the carcass has.

How is the yield grade of an ovine carcass determined?

a) Yield grades of ovine carcasses are based on external fat
   1) The primary factor is fat thickness over the center ribeye muscle between the 12th and 13th ribs.
   2) Unusual fat distribution adjusts the measurement upward or downward.
b) The formula for a yield grade is .4 + (10 × adjusted fat thickness in inches)
c) Yield grades range from 1 to 5.

3. Ask the students to list the wholesale cuts of lamb and mutton. Use TM 4.2 to illustrate the wholesale cuts.

What are the wholesale cuts of lamb and mutton?

a) Shoulder
b) Rib/rack
c) Loin
d) Leg
e) Foreshank/breast

4. Ask the class which retail cuts of lamb and mutton come from each wholesale cut. Use the National Meat Board slide set of flash cards if available to help with identification.

What are the retail cuts of lamb and mutton?

a) Leg
   1) French style leg
   2) American style leg
   3) Leg steak
   4) Lamb leg, sirloin half
   5) Sirloin chops
b) Loin
   1) Loin roast
   2) Loin chops
   3) Double loin chops
c) Rib/rack
   1) Rib roast
   2) Rib chops
   3) Rack of lamb
d) Shoulder
   1) Square cut shoulder
   2) Rolled shoulder
   3) Arm chop
   4) Blade chop
   5) Arm roast
   6) Blade roast
e) Foreshank/breast
   1) Breast
   2) Riblets
   3) Foreshank
f) Variety meats
   1) Patties
   2) Liver
   3) Kidney
   4) Heart

F. Other Activities

1. Visit a local meat processor to observe an ovine carcass being cut into retail and wholesale cuts.

2. Research Kosher regulations for ovine slaughter.

G. Conclusion

Ovine carcasses are quality graded using maturity and degree of flank streakings. Ovine yield grades are calculated using adjusted external fat measurements. Ovine carcasses are then cut into wholesale and retail cuts.

H. Answers to Activity Sheet

Carcass #	Adjusted Fat Measurement	Yield grade
1	.4	4.4
2	.25	2.9
3	.1	1.4
4	.15	1.9
5	.22	2.6
6	.31	3.5
7	.5	5.4
8	.16	2.0
9	.12	1.6
10	.18	2.2

I. Answers to Evaluation

1. c
2. a
3. d
4. a
5. d
6. b
7. Flank streaking and maturity

UNIT - INTRODUCTION TO ANIMAL PRODUCTS Name _____

Lesson 4: Lamb and Mutton Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. What is the correct yield grade for an ovine carcass with an adjusted fat measurement of .24 inch?

   a. 1.24
   b. 2.4
   c. 2.8
   d. 6.4

2. What is the correct yield grade for an ovine carcass with an adjusted fat measurement of .1 inch?

   a. 1.4
   b. 1.5
   c. 2.0
   d. 3.4

3. Which of the following are found on mutton carcasses?

   a. Break joints
   b. Light red lean
   c. Narrow ribs
   d. Spool joints

4. Which of the following is NOT a wholesale cut of lamb?

   a. Chuck
   b. Foreshank/breast
   c. Leg
   d. Loin

5. Which of the following retail cuts comes from the leg?

   a. Blade chop
   b. Foreshank
   c. Loin chops
   d. Sirloin chops

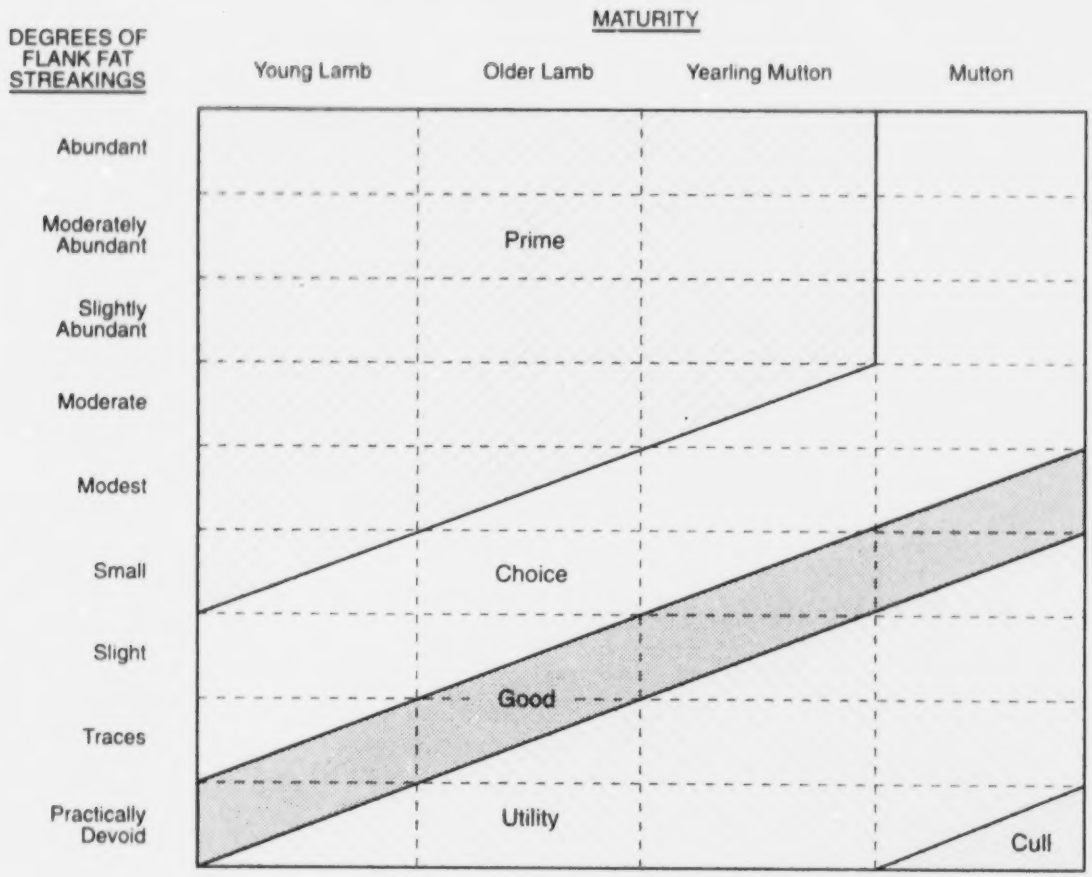
6. What are characteristics of the lean in lamb carcasses?

   a. A light red coarse-textured lean
   b. A light red fine-textured lean
   c. A dark red coarse-textured lean
   d. A dark red fine-textured lean

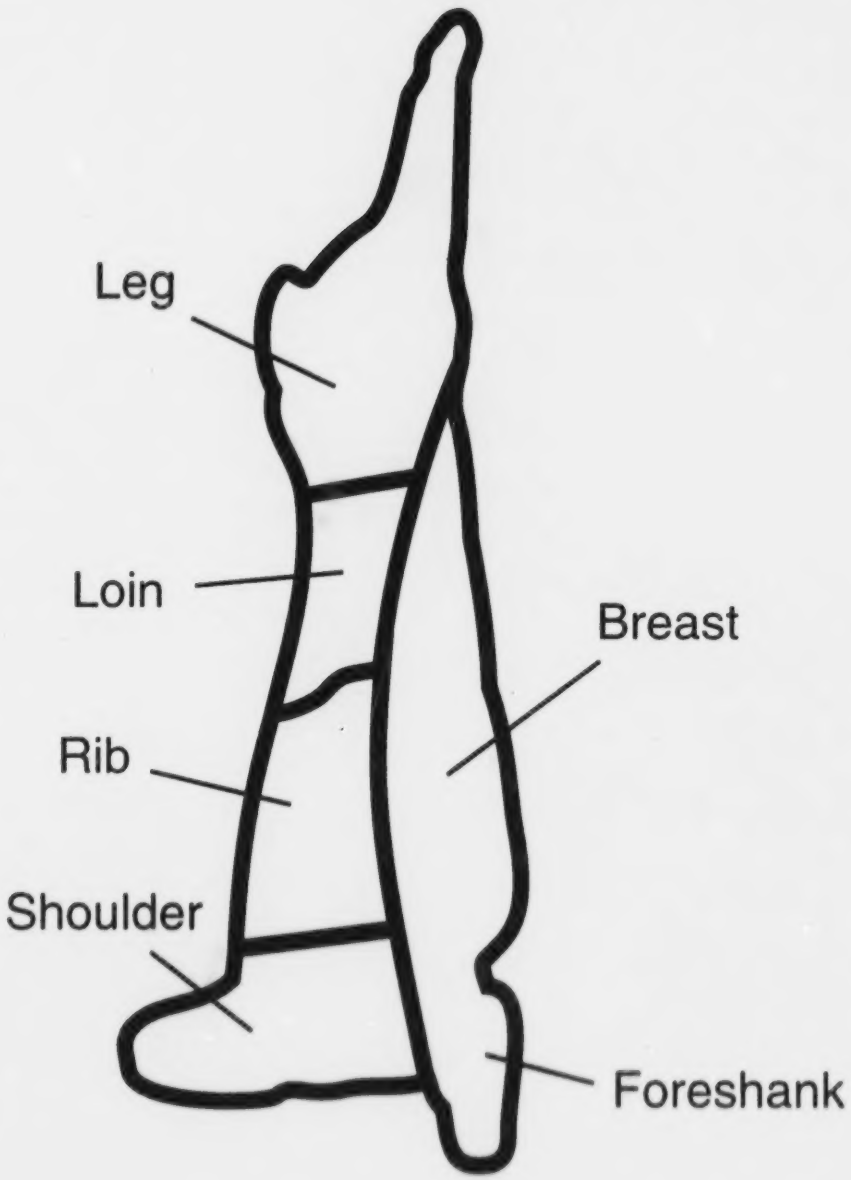
Complete the following short answer question.

7. What factors are used to determine the quality grade of an ovine carcass?

Ovine Carcass Quality Grading



Wholesale Cuts of Ovine Carcasses



Lesson 4: Lamb and Mutton Name _____

Ovine Carcass Yield Grading

Objective: Determine the yield grades of ovine carcasses given the necessary parameters.

Calculate the yield grades of the following ovine carcasses.

Formula: .4 + (10 × adjusted fat measurement) = yield grade

Carcass #	Adjusted Fat Measurement	Yield Grade
1	.4	
2	.25	
3	.1	
4	.15	
5	.22	
6	.31	
7	.5	
8	.16	
9	.12	
10	.18	

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 5: Poultry Products

Competency/Objective: Identify and grade poultry products.

Study Questions

1. **What are the edible parts of poultry?**

2. **How is ready-to-cook poultry graded?**

3. **What quality factors influence egg grading?**

References

1. *Introduction to Animal Products (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1998.

2. Transparency Masters

   a) TM 5.1: Poultry Grading - A Quality
   b) TM 5.2: Poultry Grading - B Quality
   c) TM 5.3: Poultry Grading - C Quality
   d) TM 5.4: Egg Grading
   e) TM 5.5: Summary of U.S. Standards for Quality of Individual Shell Eggs

3. Activity Sheets

   a) AS 5.1: Poultry Grading (Instructor)
   b) AS 5.1: Poultry Grading (Student)

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 5: Poultry Products

TEACHING PROCEDURES

A. Review

Ovine carcass quality and yield grading along with wholesale and retail cut identification were the focus of the previous lesson. This lesson will discuss grading of poultry carcasses and eggs.

B. Motivation

Obtain an entire chicken carcass, a cutting board, and a knife. Cut up the chicken and explain to the students what the various parts are called. If time allows, demonstrate how boneless parts are achieved.

C. Assignment

D. Supervised Study

E. Discussion

1. Begin by having the students list the edible parts of a chicken or turkey carcass. List the parts on the board or overhead. Refer to the *Poultry Science Manual for National FFA Career Development Events* if available for reference pictures.

   What are the edible parts of poultry?

   a) Half
   b) Breast quarter with or without wing
   c) Breast with or without ribs
   d) Boneless, skinless breast
   e) Breast tenderloin
   f) Wishbone
   g) Leg quarter
   h) Leg
   i) Drumstick
   j) Thigh
   k) Wing
   l) Drumette
   m) Back
   n) Liver, gizzard, heart, neck

   (Note: Unless otherwise stated, skin remains attached to the parts.)

2. Ask the class how poultry carcasses are graded. Use TMs 5.1 to 5.3 for discussion. Explain the possible defects. Point out that if a carcass or part does not meet <u>all</u> minimum standards for a grade, it will be graded at the next lowest grade. Prepare four poultry carcasses as presented in AS 5.1 (Instructor). Then have students evaluate the carcasses using AS 5.1 (Student).

How is ready-to-cook poultry graded?

a) USDA grades
   1) A
   2) B
   3) C

b) Quality factors
   1) Conformation
   2) Fleshing
   3) Fat covering
   4) Defeathering
   5) Exposed flesh
   6) Discolorations
   7) Disjointed and broken bones
   8) Missing parts
   9) Freezing defects

3. Ask students in what ways eggs are graded. Explain that the air cell, white, and yolk are evaluated using a candling light. Let the students practice egg grading if time permits. You will need a candling light and some farm eggs (all store eggs should be similar grades). Store a few eggs at room temperature for one week to compare their internal quality with those of freshly laid farm eggs. Use TMs 5.4 and 5.5.

What quality factors influence egg grading?

a) Shell
b) Air cell
c) White
d) Yolk

F. Other Activities

Purchase table eggs from a local store and have students bring in farm fresh eggs, if available. Assign egg grades using TM 5.5 as a reference. The USDA has slides showing the principles of egg grading and sizing.

G. Conclusion

The majority of poultry purchased by consumers has been precut into various parts. Both poultry parts and carcasses can be federally graded before being sold to consumers. Eggs are graded on the quality of the shell, air cell, white, and yolk.

H. Answers to Activity Sheet

AS 5.1 Poultry Grading

Instructor's discretion

I. Answers to Evaluation

1. d
2. a
3. b
4. a
5. air cell, white, and yolk

UNIT - INTRODUCTION TO ANIMAL PRODUCTS Name _____

Lesson 5: Poultry Products Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which poultry quality factor evaluates the shape of the carcass or part?

   a. Fleshing
   b. Fat covering
   c. Discoloration
   d. Conformation

2. Which of the following is <u>not</u> a USDA grade for poultry carcasses?

   a. AA
   b. A
   c. B
   d. C

3. What is the correct name for the largest individual part of the wing?

   a. Drumstick
   b. Drumette
   c. Leg
   d. Wing

4. Which of the following is the highest grade for eggs?

   a. AA
   b. A
   c. B
   d. C

Complete the following short answer question.

5. When eggs are graded using a candling light, what factors are being evaluated?

Ready-to-Cook Poultry - A Quality **Effective March 6, 1995**

Summary of Specifications for Standards of Quality for Individual Carcasses and Parts

(Not All Inclusive) (Minimum Requirements and Maximum Defects Permitted)

		A Quality				
Conformation:		Normal				
Breastbone		Slight curve or dent				
Back		Slight curve				
Legs and Wings		Normal				
Fleshing:		Well fleshed, considering kind and class				
Fat Covering:		Well developed layer -- especially between heavy feather tracts				
Defeathering: **Protruding pinfeathers, Diminutive feathers, and Hairs**		Free				
Exposed Flesh:[1] Weight Range		**Carcass**		**Large Carcass Parts**[2] (halves, front and rear halves)		**Other Parts**[2]
Minimum	Maximum	Breast and Legs	Elsewhere	Breast and Legs	Elsewhere	
None	2 lbs.	1/4 in.	1 in.	1/4 in.	1/2 in.	1/4 in.
Over 2 lbs.	6 lbs.	1/4 in.	1 1/2 in.	1/4 in.	3/4 in.	1/4 in.
Over 6 lbs.	16 lbs.	1/2 in.	2 in.	1/2 in.	1 in.	1/2 in.
Over 16 lbs.	None	1/2 in.	3 in.	1/2 in.	1 1/2 in.	1/2 in.
Discolorations: **Carcass**		**Lightly Shaded**			**Moderately Shaded**[3]	
		Breast and Legs	Elsewhere on carcass		Hock of leg	Elsewhere on carcass
None	2 lbs.	3/4 in.	1 1/4 in.		1/4 in.	5/8 in.
Over 2 lbs.	6 lbs.	1 in.	2 in.		1/2 in.	1 in.
Over 6 lbs.	16 lbs.	1 1/2 in.	2 1/2 in.		3/4 in.	1 1/4 in.
Over 16 lbs.	None	2 in.	3 in.		1 in.	1 1/2 in.
Discolorations: **Large Carcass Parts** (halves, front and rear halves)		**Lightly Shaded**			**Moderately Shaded**[3]	
		Breast and Legs	Elsewhere		Hock of leg	Elsewhere
None	2 lbs.	1/2 in.	1 in.		1/4 in.	1/2 in.
Over 2 lbs.	6 lbs.	3/4 in.	1 1/2 in.		3/8 in.	3/4 in.
Over 6 lbs.	16 lbs.	1 in.	2 in.		1/2 in.	1 in.
Over 16 lbs.	None	1 1/4 in.	2 1/2 in.		5/8 in.	1 1/4 in.
Discolorations: Other Parts		**Lightly Shaded**			**Moderately Shaded**[3]	
None	2 lbs.	1/2 in.			1/4 in.	
Over 2 lbs.	6 lbs.	3/4 in.			3/8 in.	
Over 6 lbs.	16 lbs.	1 in.			1/2 in.	
Over 16 lbs.	None	1 1/4 in.			5/8 in.	
Disjointed and Broken Bones:		Carcass--1 disjointed and no broken bones Parts--Thighs with back portion, legs, or leg quarters may have femur disjointed from the hip joint. Other parts--none.				
Missing Parts:		Wing tips and tail. In ducks and geese, the parts of the wing beyond the second joint may be removed if removed at the joint and both wings are so treated. Tail may be removed at base.				
Freezing Defects:		Slight darkening on back and drumstick. Overall bright appearance. Occasional pock marks due to drying. Occasional small areas of clear, pinkish, or reddish colored ice.				

[1]Maximum aggregate area of all exposed flesh. In addition, the carcass or part may have cuts or tears that do not expand or significantly expose flesh, provided the aggregate length of all such cuts does not exceed a length tolerance equal to the permitted dimensions listed above.

[2]For all parts, trimming of skin along the edge is allowed, provided at least 75 percent of the normal skin cover associated with the part remains attached, and the remaining skin uniformly covers the outer surface and does not detract from the appearance of part.

[3]Moderately shaded discolorations and discolorations due to flesh bruising are free of clots and limited to areas other than the breast and legs except for the area adjacent to the hock.

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

Ready-to-Cook Poultry - B Quality **Effective March 6, 1995**

Summary of Specifications for Standards of Quality for Individual Carcasses and Parts
(Not All Inclusive) (Minimum Requirements and Maximum Defects Permitted)

		B Quality	
Conformation: **Breastbone** **Back** **Legs and Wings**		Moderate deformities Moderately dented, curved, or crooked Moderately crooked Moderately misshapen	
Fleshing:		Moderately fleshed, considering kind and class	
Fat Covering:		Sufficient fat layer -- especially on breast and legs	
Defeathering: **Protruding pinfeathers, Diminutive feathers, and Hairs**		Few scattered	
Exposed flesh: Weight Range		**Carcass**	**Parts**
Minimum	Maximum		
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	No part on the carcass (wings, legs, entire back, or entire breast) has more than 1/3 of the flesh exposed	No more than 1/3 of flesh normally covered by skin exposed
Discolorations:[1] **Carcass**		**Carcass** Lightly or Moderately Shaded Discolorations	
		Breast and Legs	Elsewhere on Carcass
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	1 1/4 in. 2 in. 2 1/2 in. 3 in.	2 1/4 in. 3 in. 4 in. 5 in.
Discolorations:[1] **Large Carcass Parts** (halves, front and rear halves)		**Large Carcass Parts**	
		Breast and Legs	Elsewhere
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	1 in. 1 1/2 in. 2 in. 2 1/2 in.	1 1/4 in. 1 3/4 in. 2 1/2 in. 3 in.
Discolorations:[1] **Other Parts**		**Other Parts** Lightly or Moderately Shaded Discolorations Breasts, Legs, and Parts	
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	3/4 in. 1 in. 1 1/2 in. 1 3/4 in.	
Disjointed and Broken Bones:		Carcass--2 disjointed and no broken bones, or 1 disjointed and 1 nonprotruding broken bone Parts--may be disjointed, no broken bones; wing beyond second joint may be removed at a joint	
Missing Parts:		Wing tips, 2nd wing joint and tail.	
Trimming:		**Carcass**	**Parts**
		Slight trimming of the carcass is permitted provided the meat yield of any part on the carcass is not appreciably affected. The back may be trimmed in an area not wider than the base of the tail to the area halfway between the base of the tail and the hip joints.	A moderate amount of meat may be trimmed around the edge of a part to remove defects.
Freezing Defects:		May lack brightness. Few pockmarks due to drying. Moderate areas showing a layer of clear, pinkish, or reddish colored ice.	
[1]Discolorations due to flesh bruising shall be free of clots and may not exceed one-half the total aggregate area of permitted discoloration.			

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

Ready-to-Cook Poultry - C Quality **Effective March 6, 1995**
Summary of Specifications for Standards of Quality for Individual Carcasses and Parts
(Not All Inclusive) (Minimum Requirements and Maximum Defects Permitted)

<table>
<tr><th colspan="3"></th><th>C Quality</th></tr>
<tr><td colspan="3">Conformation:
Breastbone
Back
Legs and Wings</td><td>Abnormal
Seriously curved or crooked
Seriously crooked
Misshapen</td></tr>
<tr><td colspan="3">Fleshing:</td><td>Poorly fleshed</td></tr>
<tr><td colspan="3">Fat Covering:</td><td>Lacking in fat covering over all parts of carcass</td></tr>
<tr><td colspan="3">Defeathering:
Protruding pinfeathers, Diminutive feathers, and Hairs</td><td>Scattering</td></tr>
<tr><td colspan="2">Exposed Flesh:
Weight Range</td><td rowspan="2">Carcass</td><td rowspan="2">Parts</td></tr>
<tr><td>Minimum</td><td>Maximum</td></tr>
<tr><td>None
Over 2 lbs.
Over 6 lbs.
Over 16 lbs.</td><td>2 lbs.
6 lbs.
16 lbs.
None</td><td colspan="2">No limit</td></tr>
<tr><td colspan="2" rowspan="2">Discolorations:
Carcass</td><td colspan="2">Carcass</td></tr>
<tr><td>Breast and Legs</td><td>Elsewhere on Carcass</td></tr>
<tr><td>None
Over 2 lbs.
Over 6 lbs.
Over 16 lbs.</td><td>2 lbs.
6 lbs.
16 lbs.
None</td><td colspan="2">No limit on size, number of areas, or intensity of discolorations and flesh bruises if such areas do not render any part of the carcass unfit for food.</td></tr>
<tr><td colspan="3">Disjointed and Broken Bones:</td><td>No limit</td></tr>
<tr><td colspan="3">Missing Parts:</td><td>Wing tips, wings, and tails

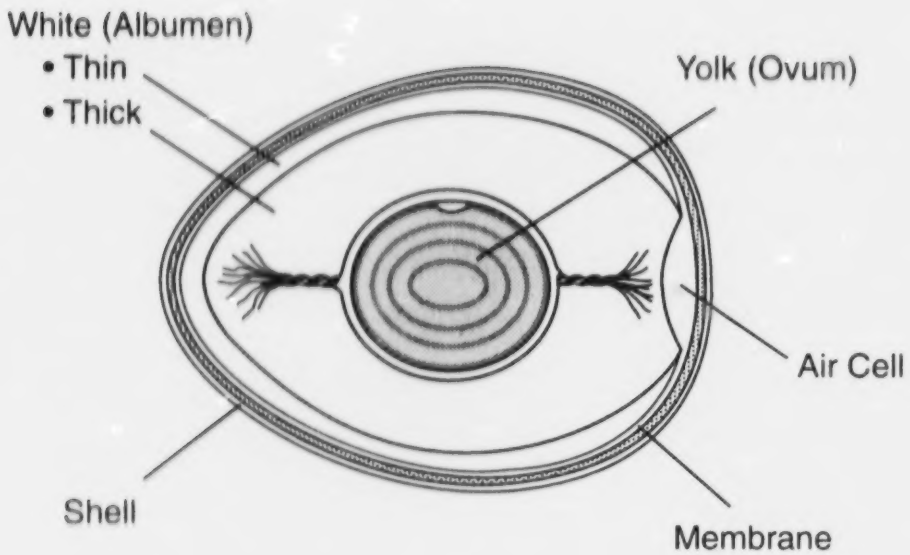
Backs shall include all meat and skin from the pelvic bones, except that the meat contained in the ilium (oyster) may be removed.

The vertebral ribs and scapula with meat and skin and the backbone located anterior (forward) of the ilia bones may also be removed (front half of back).</td></tr>
<tr><td colspan="3" rowspan="2">Trimming:</td><td>Carcass</td><td>Parts</td></tr>
<tr><td colspan="2">Trimming of the breast and legs is permitted, but not to the extent that the normal meat yield is materially affected.

The back may be trimmed in an area not wider than the base of the tail to the area between the hip joints.</td></tr>
<tr><td colspan="3">Freezing Defects:</td><td colspan="2">Numerous pockmarks and large dried areas</td></tr>
</table>

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

Egg Grading



Summary of U.S. Standards for Quality of Individual Shell Eggs

SUMMARY OF U.S. STANDARDS FOR QUALITY OF INDIVIDUAL SHELL EGGS Specifications for Each Quality Factor			
Quality Factor	AA Quality	A Quality	B Quality
Shell	Clean. Unbroken. Practically normal.	Clean. Unbroken. Practically normal.	Clean to slightly stained.* Unbroken. Abnormal.
Air Cell	1/8 inch or less in depth. Unlimited movement and free or bubbly.	3/16 inch or less in depth. Unlimited movement and free or bubbly.	Over 3/16 inch in depth. Unlimited movement and free or bubbly.
White	Clear. Firm.	Clear. Reasonably firm.	Weak and watery. Small blood and meat spots present.**
Yolk	Outline slightly defined. Practically free from defects.	Outline fairly well defined. Practically free from defects.	Outline plainly visible. Enlarged and flattened. Clearly visible germ development but not blood. Other serious defects.
For eggs with dirty or broken shells, the standards of quality provide two additional qualities. They are:			
Dirty		Check	
Unbroken. Adhering dirt or foreign material, prominent stains, moderate stained areas in excess of B quality.		Broken or cracked shell but membranes intact, not leaking.***	
* Moderately stained areas permitted (1/32 of surface if localized, or 1/16 if scattered). ** If they are small (aggregating not more than 1/8 inch in diameter). ***Leaker has broken or cracked membranes, and contents leaking or free to leak.			

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Grading of Shell Eggs* (7 CFR Part 56) Effective May 1, 1997, and *United States Standards, Grades, and Weight Classes for Shell Eggs* (AMS 56) Effective April 6, 1995. Washington, DC.

Lesson 5: Poultry Products

Poultry Grading

Objective: The student will become familiar with USDA quality grades of poultry.

Instructor Directions:

Obtain four whole chicken carcasses from a local store. Hang the carcasses with their feet pointing up and their necks pointing down. Using the USDA quality grade tables, prepare one A grade, two B grades, and one C grade from the four birds. Then assign each bird a three digit number and allow students to practice grading the birds. Have students refer to their student references for the quality grading tables and descriptive information.

To prepare the various grades, follow these recommendations.

A grade - Use the chicken straight from the package.

B grade - On one chicken, remove wings at second joint. On a second chicken, cut the skin on the breast up to 1-1/4 inches along the breast. Do not, however, cut into the meat.

C grade - On this chicken, remove an entire wing.

Lesson 5: Poultry Products Name _____

Poultry Grading

Objective: Grade poultry carcass for quality.

Directions:

1. Your instructor will provide four poultry carcasses for you to grade based on the quality factors presented in your student reference.
2. Closely evaluate each carcass. Fill in the table as you evaluate each carcass. Make sure you record the carcass number in the top of each column.
3. Determine the quality grade for each carcass. Record your grade in the table.

Quality Factors	**Carcass #** _____	**Carcass #** _____	**Carcass #** _____	**Carcass #** _____
Conformation Breastbone Back Legs and Wings				
Fleshing:				
Fat covering:				
Defeathering:				
Exposed flesh:				
Discolorations:				
Disjointed and broken bones:				
Missing parts:				
Freezing defects:				
Quality grade				

NOTE: If you touch the poultry carcasses, wash your hands thoroughly.

UNIT - INTRODUCTION TO ANIMAL PRODUCTS

Lesson 6: Dairy Products

Competency/Objective: Identify and describe types of dairy products.

Study Questions

1. **Which consumer products are eligible to be made from which grades of milk?**
2. **What are the major processes or treatments given to fluid milk?**
3. **How do flavor defects affect milk quality?**
4. **What are the identifying characteristics of cheeses?**

References

1. *Introduction to Animal Products (Student Reference).* University of Missouri-Columbia: Instructional Materials Laboratory, 1998.
2. Activity Sheets
   a) AS 6.1: Comparing Dairy Products
   b) AS 6.2: Comparing Different Cheeses for Nutritional Value

UNIT - ANIMAL PRODUCTS

Lesson 6: Dairy Products

TEACHING PROCEDURES

A. Review

Lesson 5 discussed the grading of poultry products, including eggs. This lesson will focus on milk grades, milk processing, milk defects, and types of cheeses.

B. Motivation

1. Obtain samples of a few types of cheeses, e.g., blue, Colby, Cheddar and mozzarella. Have the class distinguish between these cheeses using study question four as a guide. Tell the students that when the lesson is complete they will be able to describe differences in taste, smell, and appearance among various cheeses.

2. Purchase samples of the dairy products listed on AS 6.1. Have students compare the real to the imitation dairy products. Discuss students' answers.

C. Assignment

D. Supervised Study

E. Discussion

1. Ask the class what the two grades of milk are. Make columns on the board or overhead, and list the products that can be made from each grade. Butter, dry milk products, cheeses (except cottage in some markets), and frozen desserts (in most markets) may be made from milk of manufacturing grade. Have students bring in a milk carton or jug and find the grade stamp on the package.

Which consumer products are eligible to be made from which grades of milk?

a) Milk can be either grade A or manufacturing grade
   1) Grade A milk originates from grade A dairies. Fluid milk products must be made from only grade A milk. Other dairy foods may be made from grade A milk.
   2) Manufacturing grade milk can only be used for "manufactured" dairy products, including butter, dry milk products, cheeses (except cottage in some markets), and frozen deserts (in most markets).

2. Ask the class how raw milk is processed. Discuss the difference between pasteurization and homogenization.

What are the major processes or treatments given to fluid milk?

a) Pasteurization
   1) Heating to 161°F and above
   2) Over 15 seconds
   3) Kills bacteria and other disease-causing microorganisms
b) Homogenization
   1) Milk is passed through a fine orifice (opening) under high pressure to break fat globules into smaller sizes.
   2) This treatment prevents milk from separating into cream and skim milk.

c) Addition of Vitamins A and D.
   1) Vitamin D must be added to all fluid milk.
   2) Vitamin A must be added to milk containing less than 3.25% milk fat.

3. Ask the class how defects might affect the suitability of milk for consumption in the fluid or manufactured form. List the various taste defects on the board. If time permits, prepare off flavors for students to smell or taste.

How do flavor defects affect milk quality?

a) Milk is naturally sweet and bland-tasting
b) Off flavors of milk and their effect on milk saleability
   1) Bitter - not saleable
   2) Feed - reduces flavor appeal
   3) Flat/watery - reduces flavor appeal
   4) Foreign - not saleable
   5) Malty - will probably make the milk unsaleable
   6) Oxidized - will usually make the milk unsaleable
   7) Rancid - not saleable
   8) Salty - reduces flavor appeal
   9) Sour - not saleable

4. Ask students for the names of cheeses they have eaten or seen at the grocery store. Write the cheese names on the board. List characteristics of various cheeses. Obtain cheese samples to show to the class. Have students complete AS 6.2. The instructor should obtain packages of cheese types listed on the activity sheet.

What are the identifying characteristics of cheeses?

a) Cheese varies in color, taste, and texture (solid to porous, soft to firm, smooth to grainy)
b) Types of cheeses
   1) Blue - white, blue mold running through the cheese, peppery taste, semisoft
   2) Brick - yellow, small openings, mild to medium-strong flavor, smooth and waxy, semisoft
   3) Brie/Camembert - mild to pungent flavor, very soft but with a thin crust
   4) Cheddar - yellow, nut-like flavor, can be mild to sharp in flavor, firm but smooth texture
   5) Colby - yellow, many irregular openings, mild and slightly sour, softer than Cheddar
   6) Cottage - made from skim milk, soft, curds are cut into cubes
   7) Cream - soft, white, spreadable cheese, unripened, nut-like and slightly sour flavor
   8) Gouda/Edam - similar to Cheddar in taste, but is less sour, nutty flavor, round openings throughout
   9) Monterey Jack - white to light yellow, small holes throughout the cheese, softer than Colby
   10) Mozzarella - white, stringy pizza cheese, bland flavor
   11) Munster (Muenster) - yellow to white, mild to mellow butternut flavor, semisoft
   12) Pasteurized Process American - yellow to white, heated mixture of cheeses
   13) Provolone - yellow to white color with a smokey and/or salty flavor, hard
   14) Swiss - yellow to white, large gas holes, sweet, nut-like flavor, firm

F. Other Activities

1. Buy the varieties of cheeses listed above and work with students to determine the differences among them.

2. Prepare various off flavors of milk and let students experience the difference between high quality milk and milk with flavor defects.

G. Conclusion

All pasteurized fluid milk is from grade A dairies. Milk for drinking is pasteurized and homogenized, and vitamins are added during processing. Off flavors can be caused by exposure to contaminants, by being poorly cooled, and by exposure to sunlight or fluorescent light. Cheeses can be identified by taste, smell, and appearance.

H. Answers to Activity Sheets

AS 6.1 - Comparing Dairy Products

Product	Texture	Color	Flavor
Butter Margarine	Both smooth when left at room temperature. Butter is very hard when refrigerated.	Yellow, depending on added coloring	Creamy Nutty to oily
Whipped cream Nondairy topping	Light, fluffy Light, fluffy	White White	Milk to cream Virtually none unless vanilla is added
Half and half Coffee whitener	Liquid Liquid	White White	Cream Artificial milk
Real cheese Imitation cheese	Firm and smooth Very firm, grainy	Light yellow Unnatural color	Cheese-like Oily

AS 6.2 - Comparing Different Cheeses for Nutritional Value

Answers will vary.

I. Answers to Evaluation

1. a
2. c
3. b
4. d
5. To kill bacteria and other disease-causing microorganisms in the milk

UNIT - INTRODUCTION TO ANIMAL PRODUCTS Name _____

Lesson 6: Dairy Products Date _____

EVALUATION

Circle the letter that corresponds to the best answer.

1. Fluid milk comes from which grade of dairy farm?

   a. A
   b. B
   c. C
   d. D

2. Which of the following processes breaks down the fat globules of milk into smaller droplets?

   a. Grading
   b. Pasteurization
   c. Homogenization
   d. Adding vitamins

3. If the taste of milk is similar to the odor of silage, which of the following defects is present?

   a. Foreign
   b. Feed
   c. Flat
   d. High acid

4. Which variety of cheese has colored mold running throughout and a peppery taste?

   a. Cream
   b. American
   c. Swiss
   d. Blue

Complete the following short answer question.

5. Why is milk pasteurized?

Lesson 6: Dairy Products Name _____

Comparing Dairy Products

Objective: Compare real versus imitation dairy products for texture, color, and flavor.

Obtain samples of margarine, butter, whipped cream, non-dairy topping, coffee creamer, half and half, real cheese, and imitation cheese. Compare the products as paired in the table below. Record your observations.

Product	Texture	Color	Flavor
Butter Margarine			
Whipped cream Nondairy topping			
Half and half Coffee whitener			
Real cheese Imitation cheese			

Lesson 6: Dairy Products Name _____

Comparing Different Cheeses for Nutritional Value

Objective: Compare the nutritional value for different varieties of cheese.

Materials:

NOTE: Use as many of the cheeses listed below as possible. The cheeses need to be in a store package that contains the original label including the nutrition information.

Blue
Brick
Brie/Camembert
Cheddar
Colby
Cottage
Cream
Gouda/Edam
Monterey Jack
Mozzarella
Munster (Meunster)
Pasteurized Process American (real not imitation)
Provolone
Swiss
Processed Cheese Food (imitation)

Directions:

1. Complete the table on the back of this page. If the cost of the cheese is not on the label, check with your instructor for pricing information.

2. Answer the following questions.

   a. From a nutrient standpoint, which cheese is the "best buy"? Explain your answer.

   b. What relationship is there between firmness/softness and percent protein? Percent fat?

Cheese type	Serving size by weight	Calories per serving	Fat per serving (grams)	Protein per serving (grams)	Calcium per serving (mg)	Number of servings per package	Cost of package	Cost per serving	Cost per gram of protein	Cost per gram of fat	Rank from Softest (1) to Firmest (15)
Blue											
Brick											
Brie/ Camembert											
Cheddar											
Colby											
Cottage											
Cream											
Gouda/ Edam											
Monterey Jack											
Mozzarella											
Munster											
Pasterized Process American											
Provolone											
Swiss											
Processed Cheese Food											

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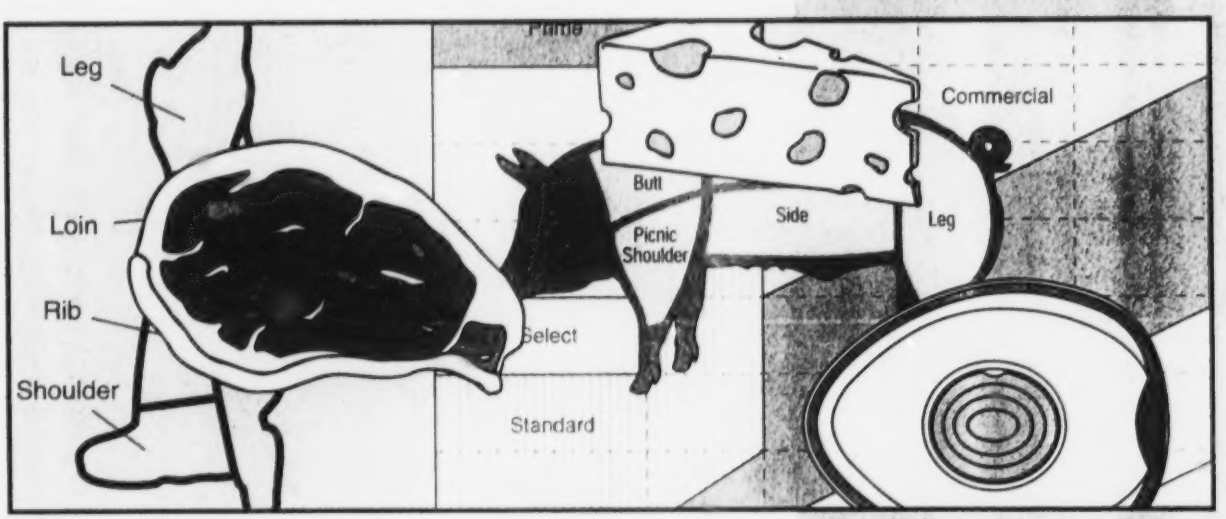
Introduction to

ANIMAL PRODUCTS

student reference



In cooperation with
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Department of Practical Arts and Vocational-Technical Education
College of Education and College of Agriculture, Food and Natural Resources
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In cooperation with
Agricultural Education Section
Division of Vocational and Adult Education
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Jefferson City, Missouri

MISSOURI AGRICULTURAL EDUCATION

Instructional Materials Laboratory
University of Missouri-Columbia

Student Reference

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FOREWORD

The development of the *Introduction to Animal Products* curriculum guide is the result of suggestions by the MVATA Teaching Aids Committee. The Animal Products Advisory Committee suggested the topics to be included and reviewed the materials. In addition several technical experts reviewed the materials for content accuracy.

This student reference contains six lessons: importance of animal products, beef, pork, lamb and mutton, poultry products, and dairy products. An instructor guide can be purchased separately.

During the summer of 1981, the Missouri State Board of Education formally adopted the concept of "Instructional Management Systems" (IMS) as a priority for the 1981-82 school year. The Missouri Commissioner of Education described the IMS concept as a practical way of "organizing for excellence" in education. To meet the demand for greater productivity and accountability, the director of Vocational Education applied the elements of IMS to form the Vocational Instructional Management System (VIMS). The VIMS process provides a framework to use in planning and organizing to assure excellence in Missouri's vocational education system by focusing greater attention on the management of teaching and learning.

The instructor guide to accompany this student reference incorporates the needed component parts to aid agriculture teachers in the implementation of VIMS.

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Department of Elementary and
Secondary Education

INTRODUCTION TO ANIMAL PRODUCTS

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Animal agriculture takes many forms throughout the United States and worldwide; however, the majority of large animal agriculture is for the purpose of producing high quality meat, poultry, dairy products, and eggs. The animal processing industry is a constantly changing, consumer-driven industry that provides billions of dollars and numerous jobs for the economy.

Animal Processing Industry

The animal processing industry has evolved into a large, corporate, automated industry, which utilizes the entire animal in some manner. The origin of the animal processing industry can be traced back to the time when small, privately-owned processing plants processed a few animals each day. Today, the majority of animals are processed in large state-of-the-art facilities that handle thousands of animals per day. Furthermore, many of the newer processing plants have their own rendering facilities, which turn inedible parts into by-products, such as blood meal, bone meal, and feather meal, just to name a few.

Several key legislative acts have helped bring consistency and safety to the animal processing industry. The Meat Inspection Act of 1906 was the beginning of federal meat inspection by the United States Department of Agriculture (USDA). The Meat Inspection Act of 1906 was prompted by consumer concerns about the wholesomeness of meat products and the sanitary conditions of processing plants. In 1921, the Packers and Stockyards Act was passed to prevent unfair business dealings by packing and stockyard companies. One benefit of this act was the initiation of scale testing in sale barns and packing facilities. Scales are tested to ensure accuracy of weighed animals and products. Next in 1967, the Wholesome Meat Act was passed, which made state inspection similar to federal meat inspection. The 1967 Wholesome Meat Act has been revised several times. Presently, meat, poultry, and egg inspections are implemented by the USDA's Food Safety and Inspection Service. Inspection ensures wholesomeness, safety, and accurate labeling of meat, poultry, and egg products.

Career Opportunities

There are thousands of jobs and careers related to animal processing. These include livestock buyers, federal inspectors, USDA meat graders, quality control supervisors, and butchers, just to highlight a few careers.

Livestock buyers purchase animals for the processing company. Livestock buyers must be skilled in animal evaluation and meat grading in order to determine a fair market value for the livestock that they are purchasing.

Federal inspectors carry out the rules and regulations set by the USDA in order to ensure the safety of our food supply. Inspectors check the sanitary conditions of the processing plants and also inspect the health and wholesomeness of the animals, dairy products, and eggs being processed.

USDA meat graders assign meat grades for quality and cutability (yield grades) of meat carcasses. Unlike federal inspections, federal grading is not required. However, the grades that are assigned determine the value of the food product. Yield grades predict the amount of boneless closely trimmed retail cuts from the carcass, while quality grades predict the tenderness, taste, and juiciness of the meat.

Quality control supervisors manage employees and ensure that quality work is being done to provide a high quality finished product.

Butchers cut carcasses into retail and wholesale cuts. They also process live animals into carcasses.

Economic Impact

The economic impact of the U.S. animal processing industry is quite extensive with billions of dollars worth of meat, dairy, and egg products sold each year alone. There were more than 358 billion dollars sold in 1994. In addition, animal by-products contribute to the profits of the processor. A by-product is any product produced in addition to the primary product. In the animal processing industry, by-products can be edible such as heart or brains or inedible such as skin, hair, and bones. With the expanded use of inedible by-products, the economic impact is quite high. Many inedible by-products are used in animal feeds and pet foods. A majority of animal processors' profits are derived from the sale of inedible by-products, which include leather from cattle hides, feather meal from chicken/turkey feathers, blood meal, fish meal, and bone meal. These by-products are used by other industries and operations, such as pharmaceuticals, clothing, and animal feeds, just to mention a few.

Processing Affects Value of Product

Many different businesses are involved in the animal processing industry. Some processors purchase the raw animal product (animal, milk, or eggs) from the producer and process it into wholesale products. Other processors purchase the raw product and do all the processing needed to make the edible products available at the retail level. Still many other processors not only process the edible products but process the by-products as well. As discussed earlier, by-products can be edible or inedible. The more processing that the processor does to the raw product, the more the business is able to receive for the end products, edible or inedible.

The amount of processing the raw product (e.g., beef cattle) receives affects the cost of the end product (e.g., ground beef, chili with beef). The more processing steps involved, the higher the cost of the end product will be. Value-added products, such as microwave ready and ready-to-eat products, have gone through many processing steps on the way to the consumer. Consumers are willing to pay more because less time will be required for them to prepare these products to eat. For example, it would take a significant amount of time to make beef chili if the consumer had to start from the raw product (beef animal) and process it into hamburger and then process (cook) the hamburger to be put in the chili and then process (cook) the chili.

Summary

Animal processing has evolved into a large multi-billion dollar industry under the regulation of the USDA. Many careers are directly involved in the processing of animals. The sale of value-added products and by-products help the animal processing industry remain profitable.

Credits

Martin, Phillip. *Food Science and Technology.* University of Missouri-Columbia: Instructional Materials Laboratory, 1994.

United States Department of Agriculture. National Agricultural Statistics Service. *Ag Statistics 95-96.* Washington, DC.

Beef carcasses are inspected and then quality and yield graded while in the processing plant. After grading, the carcass is split into wholesale, or primal, cuts which are sold to retail stores. At the retail level, the wholesale cuts are cut into smaller retail cuts of beef which are purchased by the consumer.

When officially graded, beef carcasses may consist of a quality grade only, a yield grade only, or a combination of the quality grade and the yield grade. An exception is for bull carcasses which can only receive a yield grade. The United States Department of Agriculture (USDA) graders use photographs and other objective aids to correctly interpret and apply the standards. Only a brief overview of the standards will be covered in this lesson. For more detailed information, one should review the *United States Standard for Grades of Carcass Beef* from the USDA.

Quality Grading

Beef carcasses are graded for quality to provide an indicator of the palatability of the lean. Palatability refers to tenderness, juiciness, and flavor of the meat. Beef carcasses are divided into two sections: 1) steers, heifers, and cows and 2) bullocks. Steer and heifer beef are eligible for Prime, Choice, Select, Standard, Commercial, Utility, Cutter, and Canner quality grades. Cow beef is eligible for the same designations except for Prime. Bullock beef is only available for Prime, Choice, Select, Standard, and Utility quality grades.

To determine the grade of a carcass, it must be split down the back into two sides and one or both sides must be partially separated into a hindquarter and a forequarter. The hindquarter and forequarter separation is made at the 12th thoracic vertebra. The separation must be done cleanly so that the grader can accurately evaluate the lean and the maturity of the carcass.

The quality of the beef is determined by evaluating the quality of the lean in relation to carcass evidences of maturity. The maturity of the carcass is determined by evaluating the size, shape, and ossification of the bones and cartilages and the color and texture of the lean flesh. Lean characteristics of marbling and firmness are observed in the cut surface of the rib eye between the 12th and 13th thoracic vertebrae.

Maturity - To facilitate the application of the principles, the standards recognize five different maturity groups. The five maturity groups are identified in Figure 2.1 as A, B, C, D, and E in order of increasing maturity. The youngest and most common maturity is A which usually refers to animals 30 months of age or younger. The A and B maturity groups are for young animals only. Maturity groups C through E are older animals.

In the youngest beef carcasses, the cartilages on the ends of the chine bones show no ossification, cartilage is evident on all of the vertebrae of the spinal column, and the sacral vertebrae show distinct separation. In addition, the split vertebrae usually are soft and porous and very red in color. The rib bones have only a slight tendency toward flatness. In progressively more mature carcasses, ossification changes become evident first in the bones and cartilages of the sacral vertebrae, then in the lumbar vertebrae, and still later in the thoracic vertebrae. In beef which is very advanced in maturity, all the split vertebrae will be devoid of red color, be very hard and flinty, and the cartilages on the ends of all the vertebrae will be entirely ossified. Likewise, with advancing maturity, the rib bones will become progressively wider and flatter until in very mature beef the ribs will be very wide and flat.

In the youngest beef carcasses, the lean flesh will be very fine in texture and light grayish red in color. In progressively more mature carcasses, the texture of the lean will become progressively coarser and the color of the lean will become progressively darker red. In very mature beef, the lean flesh will be very coarse in texture and very dark red in color. In determining the maturity of a carcass in which the skeletal evidences of maturity are different from those indicated by the color and texture of the lean, slightly more emphasis is placed on the characteristics of the bones and cartilages than on the characteristics of the lean. For bullock carcasses having darker colors of lean than specified in the standards, additional consideration is given to the carcass characteristics.

Marbling and firmness - Marbling, which is intramuscular fat, is evaluated between the 12th and 13th ribs. When you look at the rib eye muscle, the marbling appears as white flecks of fat dispersed between the muscle fibers. The degrees of marbling referenced in the specifications, in order of descending quality, are: slightly abundant, moderate, modest, small, slight, traces, and practically devoid. However, in carcass evaluation

programs and other purposes, three additional degrees are recognized: very abundant, abundant, and moderately abundant. There are color photos that graders can use to help evaluate marbling consistently. The rating for the firmness of the muscle ranges from firm to very soft and watery. The standards spell out exactly what type of firmness is required for each quality grade. The amount of firmness varies within the grade when more than one maturity level is included in the grade. For example, within the Choice Grade, the lean of an A maturity carcass can be slightly soft, but the lean of a B maturity carcass must be slightly firm.

The relationship between marbling, maturity, and quality grade is shown in Figure 2.1. This figure assumes that the firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter". A dark cutter is the result of reduced sugar content of the lean at the time slaughter. The limits of these five maturity groups are specified in the grade descriptions for steer, heifer, and cow carcasses.

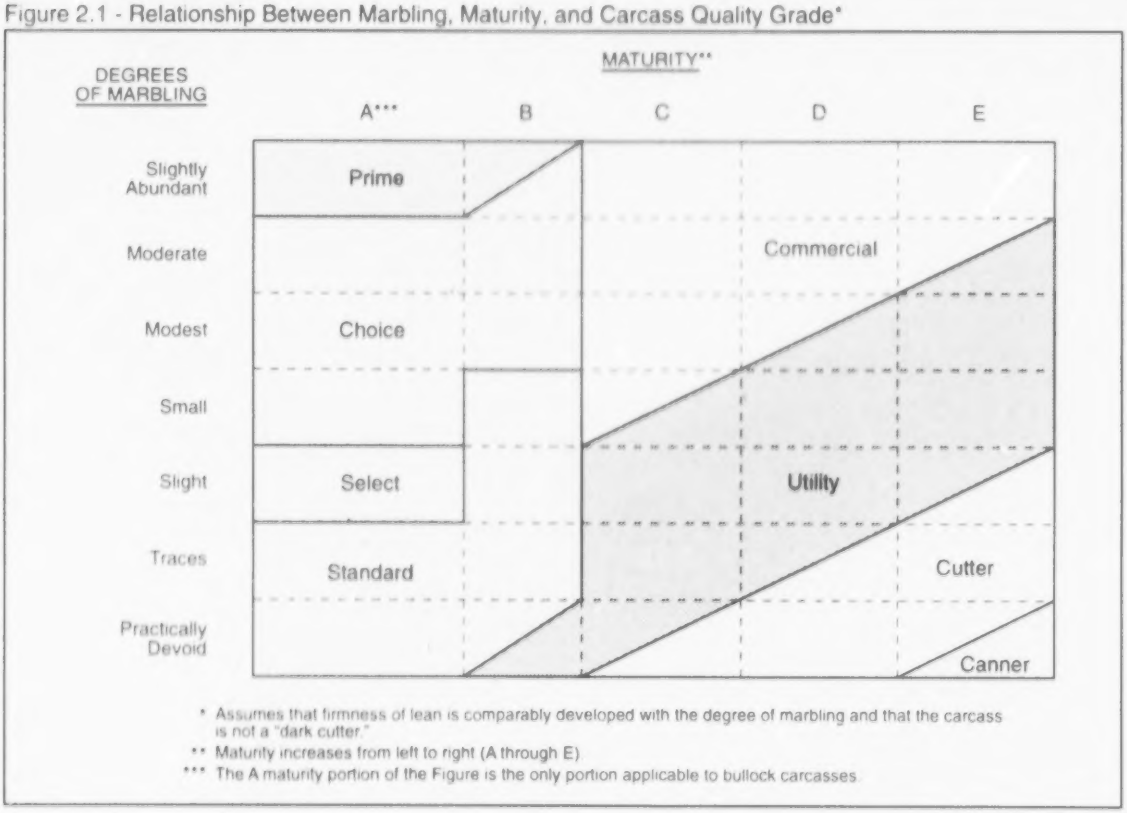
After the maturity and marbling are estimated, the grader locates the estimates in the chart in Figure 2.1 and the quality grade is determined. For example, if the carcass has a maturity of A and a small degree of marbling, the carcass would have a quality grade of Choice.

Yield Grades

The yield grade refers to the amount of saleable meat obtained from the carcass as boneless, trimmed retail cuts from the round, sirloin, short loin, rib, and square-cut chuck. Yield grades are a numerical value from 1 through 5 with 1 being leaner and more muscular than 5. In other words, a yield grade of 1 indicates the highest percentage of saleable meat and 5 indicates the lowest percentage of saleable meat. The factors that influence yield grades are external fat thickness, the amount of fat from the kidney, pelvic, and heart areas, the area of the rib eye muscle, and the carcass weight.

The yield grade of a beef carcass is determined on the basis of the following equation: Yield grade = 2.50 + (2.50 x adjusted fat thickness, inches) + (0.20

Figure 2.1 - Relationship Between Marbling, Maturity, and Carcass Quality Grade*



* Assumes that firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter."

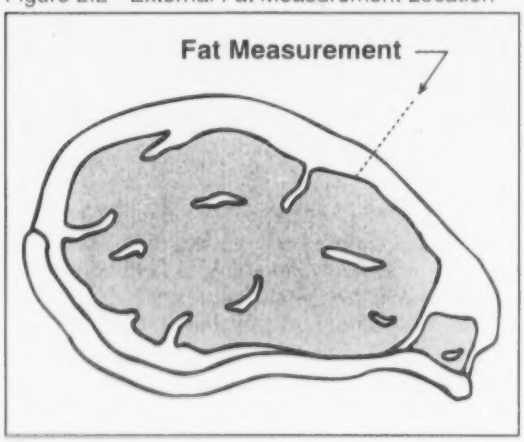
** Maturity increases from left to right (A through E).

*** The A maturity portion of the Figure is the only portion applicable to bullock carcasses.

x percent kidney, pelvic, and heart fat) + (0.0038 x hot carcass weight, pounds) - (0.32 x area rib eye, square inches). The grade is expressed as a whole number. If the calculations result in a whole number and a fraction of a number, the fraction is dropped. It is important to note that the number is NOT rounded. For example, if the calculations result in 3.7, the final grade would be 3, not rounded to 4.

External fat thickness - The amount of fat covering the rib eye gives a good approximation of the total carcass fat. However, the measurement may be adjusted if unusual amounts of fat are found on other parts of the carcass, especially in the brisket, plate, flank, cod or udder, inside round, rump, and hips. The amount is measured in tenths of an inch. The external fat is measured ¾ of the length of the rib eye from the chine bone. See Figure 2.2.

Figure 2.2 - External Fat Measurement Location



Kidney, pelvic, and heart fat - This includes the kidney and surrounding area fat, the lumbar and pelvic fat in the loin and round, and the heart fat in the chuck and brisket areas. The fat in the kidney, pelvic, and heart areas is evaluated subjectively and expressed as a percent of the carcass weight. The higher the percentage of fat, the less retail cuts are available.

Rib eye area - The actual rib eye area is measured at the 12th rib using a grid or other device approved by the Agricultural Marketing Service of the U.S. Department of Agriculture. The grid measures the muscle area in square inches. An increase in the area of rib eye increases the percent of retail cuts. A change of 1 square inch in area of rib eye changes the yield grade by approximately 30 percent of a yield grade.

Hot carcass weight - The hot carcass weight is the weight of the carcass before it is chilled. If only the chilled carcass weight is known, that amount can be multiplied by 102 to give an estimate of the hot carcass weight. Hot carcass weight is used instead of cold carcass weight because as the carcass cools, water is lost to dehydration which reduces the weight of the carcass. As carcass weight increases, the percent of retail cuts decreases. A change of 100 pounds in hot carcass weight changes the yield grade by approximately 30 percent of a yield grade.

For example: A beef carcass has the following measurements: adjusted fat thickness = .7 inches; kidney, pelvic, and heart fat = 4.5%; hot carcass weight = 625 pounds; rib eye area = 10.6 square inches

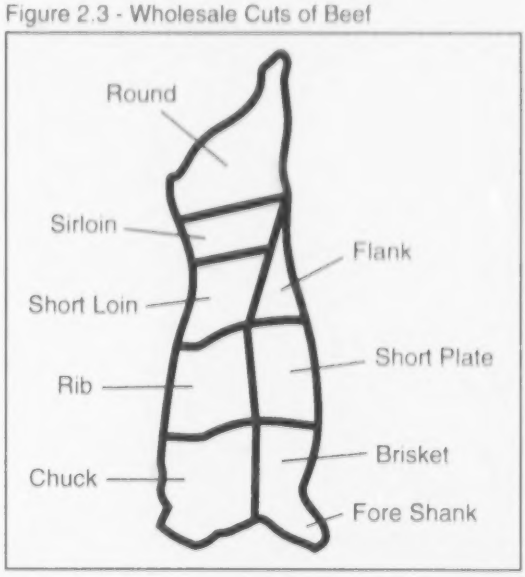
Formula: Yield grade = 2.50 + (2.50 x adjusted fat thickness, inches) + (0.20 x percent kidney, pelvic, and heart fat) + (0.0038 x hot carcass weight, pounds) - (0.32 x area rib eye, square inches)

Yield grade = 2.50 + (2.50 x .7) + (0.20 x 4.5) + (0.0038 x 625) - (0.32 x 10.6)
Yield grade = 2.50 + 1.75 + .9 + 2.375 - 3.392
Yield grade = 4.133 = Final yield grade of 4

Wholesale Cuts

The wholesale cuts of beef are the chuck, rib, short loin, sirloin, round, flank, short plate, brisket, and fore shank. See Figure 2.3.

Figure 2.3 - Wholesale Cuts of Beef



Retail Cuts

Wholesale cuts are cut into various retail cuts. Some retail cuts, such as ground beef and stew meat are made from several different wholesale cuts. Steaks and roasts are the primary types of retail cuts. Steaks are generally under 1 inch thick, and roasts are usually over 1 ½ inches thick. New versions of meat cuts are being developed and may be encountered in various regions of the country. Below is a list of the most common retail cuts from each wholesale cut.

Chuck
- Arm pot roast
- Blade pot roast
- Boneless shoulder pot roast
- Boneless top blade steak
- Chuck eye roast
- Cross rib pot roast
- Flanken-style ribs
- Mock tender
- Short ribs
- Seven bone roast
- Under blade pot roast

Rib
- Rib roast large end
- Rib roast small end
- Rib steak
- Rib eye steak
- Rib eye roast
- Back ribs

Short loin
- Boneless top loin steak
- Porterhouse steak
- T-bone steak
- Tenderloin steak and roast

Sirloin
- Sirloin steak, round bone
- Sirloin steak, flat bone
- Top sirloin steak

Round
- Bottom round roast
- Boneless rump roast
- Eye round roast
- Round steak
- Tip roast, cap off
- Tip steak
- Top round steak and roast

Flank and Short Plate
- Flank steak
- Flank steak rolls
- Skirt steak

Fore Shank and Brisket
- Brisket whole
- Brisket flat half
- Corned brisket, point half
- Shank cross cuts

Other cuts - These cuts come from more than one wholesale cut.
- Beef for stew
- Cubes for kabobs
- Cubed steak
- Ground beef

Variety meats - These retail cuts are not from any wholesale cut, but they are other edible parts of beef cattle.
- Heart
- Tongue
- Liver
- Kidney
- Tripe
- Brains
- Sweetbreads

Summary

Beef carcasses are graded for both yield and quality. Quality grades refer to how the meat will taste, while yield grades refer to how much saleable meat is available from a carcass. Wholesale cuts are divided into retail cuts which are purchased by consumers.

Credits

Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kindall/Hunt Publishing Company, 1993.

Meat Evaluation Handbook. Chicago: National Livestock and Meat Board, 1988.

United States Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Division. *United States Standard for Grades of Carcass Beef.* United States Department of Agriculture (Effective January 31, 1997).

Pork carcasses are graded and purchased on a yield basis. Continuing work is being done to accurately evaluate the quality of pork carcasses.

Pork Quality Characteristics

Pork quality is concerned with evaluating characteristics that make the edible product nutritious and wholesome after processing and storage. The pork product should also be suitable for processing, be attractive to consumers, and appetizing and palatable (flavorful) after cooking. Quality characteristics have been defined so that there is consistency from processor to processor. The characteristics that are evaluated are: muscle color, muscle firmness/wetness condition, marbling (intramuscular fat), and other tissue conditions. They are primarily evaluated in the loin muscle viewed between the 10th and 11th thoracic vertebrae.

Muscle color - The most desirable color for muscle is reddish pink. Muscle color is important because consumers do not want to buy meat that is too pale or too dark. Very light muscle tends to shrink and turn gray in retail display cases, which results in dry-tasting products after cooking. Since consumers often assume that very dark meat is from older animals, which is not necessarily true, they are less likely to buy it.

Muscle color varies from one part of the carcass to another but is usually the same color across a muscle group. Processors use color pictures to help them consistently evaluate the color of the muscle. There are five color scores: 1 = pale pinkish gray, 2 = grayish pink, 3 = reddish pink, 4 = purplish red, and 5 = dark purplish red. Carcasses scoring a 1 or 5 should be eliminated from consideration for retail cuts.

Muscle firrnness/wetness condition - The firmness or wetness of the muscle is evaluated and given a score ranging from 1 to 5. A score of 1 indicates a very soft and very watery condition. It is usually associated with pale pinkish gray muscle color. Also, it shrinks excessively during processing and lacks juiciness after cooking. A score of 2 indicates a soft and watery muscle that is not as severe as in score 1. Score 3 indicates a slightly firm and moist muscle condition. Score 4 indicates a firm and moderately dry muscle condition. A rigid, closed structure with no visible surface fluids is scored a 5. It is often associated with a purplish red or darker muscle color. Carcasses receiving a score of 1 or 2 should be eliminated from consideration for retail cuts.

Marbling - Marbling is the intramuscular fat, which is the visible fat within the boundaries of the muscle. Some marbling is considered desirable because it provides for a juicy and flavorful cooked product. There are 5 marbling scores: 1 = devoid to practically devoid, 2 = traces to slight, 3 = small to modest, 4 = moderate to slightly abundant, and 5 = moderately abundant or greater. Palatability would be decreased because lack of fat causes meat to be dry and less flavorful. Excessive fat (moderately abundant or greater) does not make the meat proportionally more flavorful but does add too many calories and therefore carcasses scoring 5 should also be eliminated from consideration for retail cuts. Carcasses scoring a 1 should be eliminated from consideration for retail cuts because these scores indicate that the meat would not be palatable.

Other tissue conditions - If either of the following conditions are present, the carcass is eliminated from consideration: steatosis and soft, oily fat. Steatosis is fatty infiltration in muscle tissue due to a problem such as muscle atrophy. Soft, oily fat is often slightly brown, is unattractive in the display case, and is more likely to turn rancid during processing and storage.

Saleable Product Determination

Although there are USDA standards for grades of pork carcasses, every packer has established its own system for grading. As pork carcasses are moved through the processing plant, cutability measurements are taken on the carcass to assign a percentage of muscle with 5 percent fat. Cutability refers to the amount of leanness and muscle or red meat an animal has. This measurement is referred to as the percent muscle or percent lean of a

Figure 3.1 - Precent Muscle Formula

$$\frac{88.307 - (.036 \times HCW) - (18.574 \times 10th\ rib\ backfat) + (3.734 \times LMA)}{170} \times 100 = \%\ muscle$$

Figure 3.2 - Sample Calculation of Percent Muscle

So if a hog carcass had a HCW of 180 pounds, 1 inch backfat at the 10th rib, and 5 square inches LMA, the percent muscle would be calculated as follows.

$$\frac{88.307 - (.036 \times 180) - (18.574 \times 1) + (3.734 \times 5)}{170} \times 100 = \%\ muscle$$

$$\frac{88.307 - 6.48 - 18.574 + 18.67}{170} \times 100 = \%\ muscle$$

$$\frac{81.923}{170} \times 100 = \%\ muscle$$

= 48.19 or 48% muscle

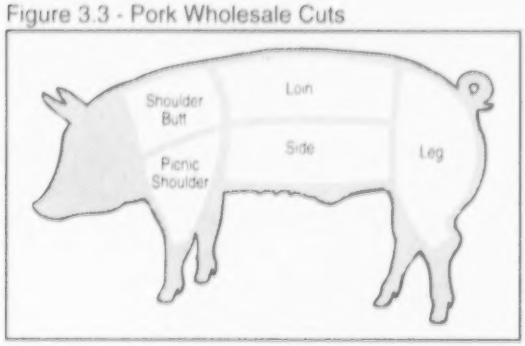
Because the percent muscle is below 50%, the producer's selling price would most likely be docked for this pork carcass.

carcass. Currently, 50 percent muscle is considered average by the industry. Carcasses over 50 percent muscle are often given a premium, which is added to their purchase price. Carcasses under 50 percent muscle are usually docked, which means the producer is paid less for carcasses under 50 percent muscle. In order to calculate percent muscle, the hot carcass weight (HCW), the average backfat thickness at the 10th rib, and loin muscle area at the 10th rib are needed. Most processing plants use loin depth to estimate loin muscle area (LMA). After these measurements are taken, they are put into a formula to derive the percent muscle which is adjusted to a 170 pound hot carcass weight (Figure 3.1). An example is provided in Figure 3.2.

Wholesale Cuts

After the carcass is measured for percent muscle, the carcass is cut into wholesale cuts and shipped to retail stores. The wholesale cuts of pork are the shoulder, loin, leg, side, and picnic shoulder. See Figure 3.3 for the location of wholesale cuts.

Figure 3.3 - Pork Wholesale Cuts



Retail Cuts

After the wholesale cuts arrive at the retail level, they are fabricated or cut into retail cuts. Pork cuts can be either fresh or cured, which enhances their flavor and taste. Below is a list of the retail cuts of pork.

Leg - The primary cuts from the leg are bone-in fresh ham, smoked ham, fresh boneless ham roast, and leg cutlets.

Loin - The primary cuts from the loin are sirloin chop, rib chop, boneless rib end chop, boneless center loin chop, butterfly chop, center rib roast, bone-in sirloin roast, boneless center loin roast, boneless rib end roast, loin chop, boneless sirloin roast, tenderloin, Canadian-style bacon, country-style ribs, and back ribs.

Shoulder butt - The pork shoulder butt is cut into the bone-in blade roast, boneless blade roast, ground pork, sausage, and blade steak.

Picnic shoulder - The retail cuts from the picnic shoulder are smoked picnic, arm picnic roast, and smoked hock.

Side - The retail cuts from the side are slab bacon, sliced bacon, and spareribs.

While variety meats are not cut from the pork carcass, they are additional edible products from the hog. They include tongue, heart, sweet breads, brains, liver, and kidney.

Summary

The quality of pork carcasses is determined by evaluating muscle color, muscle firmness/wetness, marbling, and other tissue conditions. Then pork carcasses are evaluated for cutability by calculating the percent muscle of a carcass. Hot carcass weight (HCW), average backfat thickness at the 10th rib, and loin muscle area at the 10th rib (LMA) are used to calculate the percentage of muscle on a carcass. Wholesale cuts are then divided into retail cuts. Pork can be either fresh or cured.

Credits

Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual.* 4th ed. Dubuque: Kindall/Hunt Publishing Company, 1993.

Meat Evaluation Handbook. Chicago: National Livestock and Meat Board, 1988.

Procedures to Evaluate Market Hogs. 3rd ed. Des Moines: National Pork Producers Council, 1991.

Purchasing Pork: A Consumer Guide to Identifying Retail Pork Cuts (poster). National Pork Producers Council in Cooperation with the National Pork Board, 1997.

Ovine (sheep species) carcasses are both quality and yield graded similar to beef cattle. After being graded, the carcasses are cut into wholesale cuts and then into retail cuts. Ovine carcasses usually weigh between 50 and 80 pounds.

Quality Grading

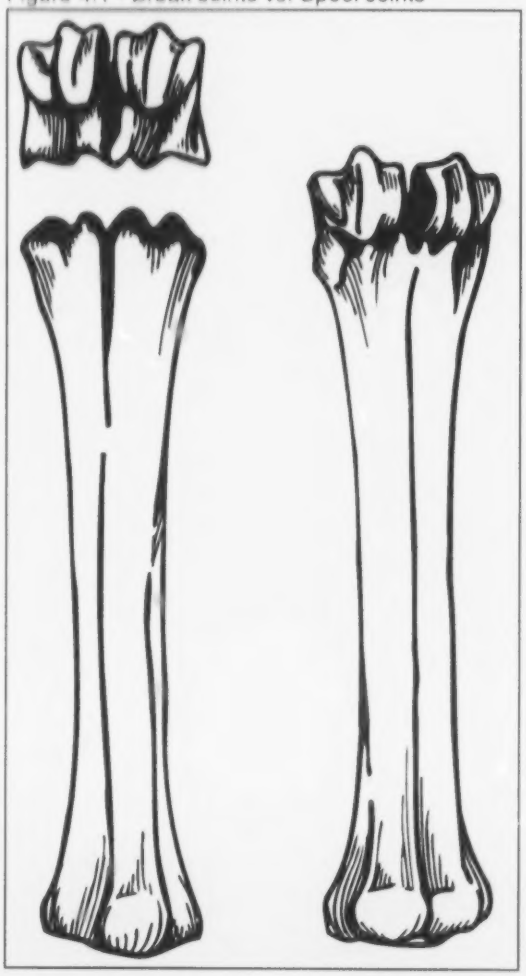
The maturity (age) of the animal is the single most important factor in determining the quality grade. There are three maturity classes: lamb, yearling mutton, and mutton. For grading purposes, the USDA has divided the lamb class into young lamb and older lamb. See Figure 4.2. Each maturity class has its own standards. In order to determine the quality grade of the carcass within each class, the fat streakings inside the flank area must be evaluated, plus a minimum degree of lean and fat firmness must be present.

Descriptions or definitions for the classes of typical ovine carcasses help in determining the maturity of the carcass. Maturity is determined by evaluating the carcass for break joints or spool joints on the front shanks, the size and flatness of the rib bones, and the color and texture of the lean. In the dressing of ovine carcasses, both front cannon bones (trotters) are usually left attached. There are some cases when one or both trotters may be removed. Trotters will end in perfect break joints, imperfect break joints, or spool joints. Figure 4.1 illustrates break and spool joints. A carcass with perfect break joints on both trotters will be classed as lamb or yearling mutton based on other evidences of maturity. A carcass with spool joints on both trotters will be classed as yearling mutton or mutton based on other evidences of maturity. If the carcass has one break joint and either a spool joint or a missing joint on the other trotter, it can be classed as lamb if other maturity characteristics of lamb are present.

Lamb carcasses must have a break joint on one of the front shanks. Their ribs are flatter and narrower than yearling mutton or mutton. The rib bones become wider as the lamb ages. In young lamb carcasses, the lean in the flank area is slightly dark pink, and for older lamb it is light red. In all lamb carcasses, the lean is fine-textured.

Yearling mutton carcasses may have either spool or break joints on their front shanks. They have wider and flatter rib bones. The lean is slightly dark red and slightly coarse in texture.

Figure 4.1 - Break Joints vs. Spool Joints

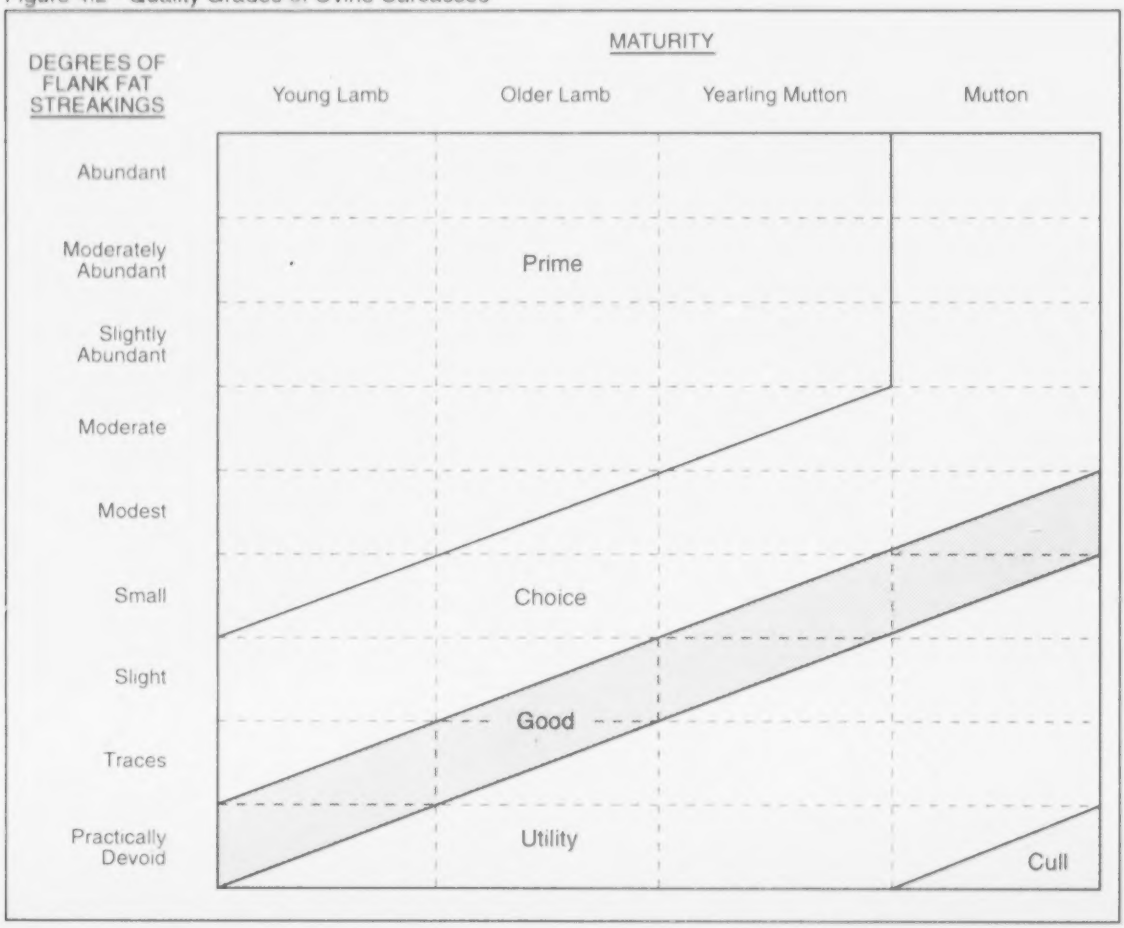


Mutton carcasses have only spool joints on their front shanks. Rib bones are wide and flat. The lean is dark red and coarse-textured.

The other determining factor of lamb quality grades is the amount of flank streaking. Flank streaking is the amount of fat streaks within and upon the inside flank of the carcass. The greater the degree of flank streaking, the more palatable the carcass should be. There are ten degrees of flank streaking: abundant, moderately abundant, slightly abundant, moderate, modest, small, slight, traces, practically devoid, and devoid.

After maturity and amount of flank streaking are determined, the quality grade is determined using the chart in Figure 4.2. The quality grades are prime, choice, good, utility, and cull. Notice that

Figure 4.2 - Quality Grades of Ovine Carcasses



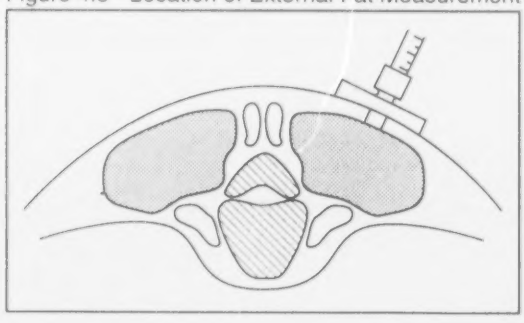
prime can be only lamb or yearling mutton and that cull can only be mutton. The chart works similarly to the quality grade chart for beef. First, the grader locates the maturity of the carcass on the chart and then locates the flank streaking degree. The point where the two meet determines the quality grade. For example, an older lamb with a small amount of flank streaking would be choice. Almost all lamb carcasses reach the choice grade.

Yield Grading

Ovine yield grades provide estimates of the amount of semi-boneless or boneless closely trimmed (.10 in fat or less) major retail cuts from the carcass. Ovine yield grades are based on the amount of external fat present. For carcasses with normal fat distribution, the external fat is measured over the center of the ribeye muscle. This measurement is taken perpendicular to the outside surface between the 12th and 13th ribs. (Figure 4.3.) An approved measuring device must be used.

If the carcass has unusual fat distribution, the grader adjusts the ribeye fat measurement upward or

Figure 4.3 - Location of External Fat Measurement



downward depending on the fat distribution over the rump, outside the shoulders, breast, flank, and cod, or udder. An adjustment of .05 inch is common with some adjustments being greater. The grader may take an additional measurement, body wall thickness, to help determine the adjustment. As the amount of external fat increases, the percent of retail cuts decreases. An accurate adjusted fat measurement is important because for every .05 inch in change, the yield grade changes one-half yield grade. The formula that is used to determine the yield grade is .4 + (10 x adjusted fat thickness in inches).

Example:

> During the evaluation of an ovine carcass, the grader determines that the external backfat is not evenly distributed. Therefore, the external backfat is adjusted to .15.
>
> .4 + (10 x .15) = yield grade
> .4 + (1.5) = yield grade
> 1.9 = yield grade
>
> A yield grade of 1.9 means the carcass is at the bottom end of a yield grade of 1. There is not much of a difference between a yield grade of 1.9 and a 2.0, so accuracy is important. The 1.9 is considered a yield grade 1 and the 2 a yield grade 2.

Ovine carcass yield grades range from 1 to 5 with a yield grade of 1 being leaner than a yield grade of 5. See Figure 4.4 for adjusted fat thickness ranges for each of the five yield grades.

Figure 4.4 - Yield Grades with Adjusted Fat Thickness Ranges

Yield Grade 1 - 0.00 to 0.15 inch
Yield Grade 2 - 0.16 to 0.25 inch
Yield Grade 3 - 0.26 to 0.35 inch
Yield Grade 4 - 0.36 to 0.45 inch
Yield Grade 5 - 0.46 and greater

Wholesale Cuts of Lamb

The wholesale cuts of lamb and mutton are the leg, loin, rib/rack, shoulder, and foreshank/breast. See Figure 4.5.

Retail Cuts

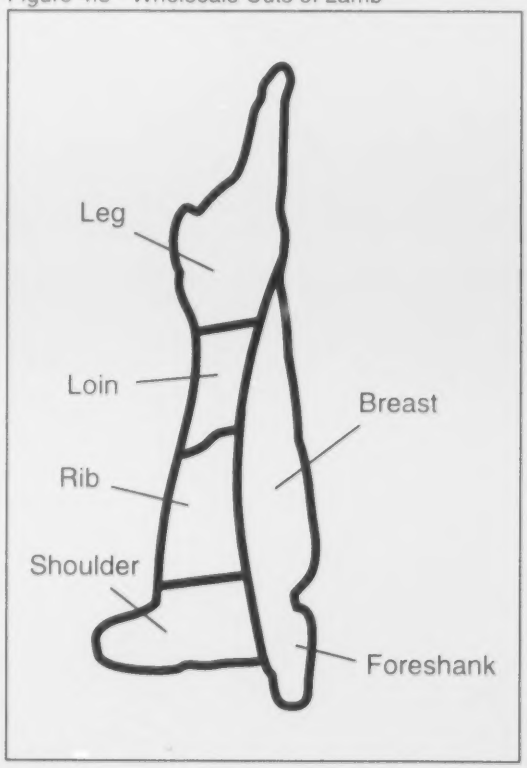
The following is a list of the retail cuts of lamb and mutton and the wholesale cuts from which they are cut.

Leg - French style leg, American style leg, leg steak, lamb leg (sirloin half), sirloin chops
Loin - Loin roast, loin chops, double loin chops
Rib/Rack - Rib roast, rib chops, rack of lamb
Shoulder - Square cut shoulder, rolled shoulder, arm chop, blade chop, arm roast, blade roast
Foreshank/breast - Breast, riblets, fore shank
Variety meats - Patties, liver, kidney, heart

Summary

Ovine carcasses are graded for both quality and yield. Quality grading provides an estimate of the potential eating quality of the meat by evaluating maturity and flank streaking. Yield grades predict the amount of semi-boneless and boneless closely trimmed retail cuts from the ovine carcass. Carcasses are then sold as wholesale and retail cuts.

Figure 4.5 - Wholesale Cuts of Lamb



Credits

Boggs, Donald L., and Robert A. Merkel. *Live Animal Carcass Evaluation and Selection Manual*. 4th ed. Dubuque: Kindall/Hunt Publishing Company, 1993.

Meat Evaluation Handbook. Chicago: National Livestock and Meat Board, 1988.

United States Department of Agriculture. Agricultural Marketing Service. Livestock and Seed Division. United States Standards for Grades of Lamb, Yearling Mutton, and Mutton Carcasses. (Effective July 6, 1992.)

The poultry industry is a nationwide, ever growing industry. However, much of the poultry is produced in the southern Midwest and the Southeast United States. Missouri is a major contributor to poultry and egg production.

Poultry Parts

Most turkeys are still sold as whole birds throughout the United States, but there is a movement toward selling turkey parts similar to chicken parts. The common chicken or broiler carcass is cut into several edible parts, they are:

Half - Entire half of a chicken

Breast quarter with or without wing - Similar to the breast with ribs, however, it also contains the back

Breast with or without ribs - Breast portion of the bird without any vertebrae, which may or may not have the wing attached

Boneless, skinless breast - Entire chicken breast or one half of the breast without skin or bones, sometimes referred to as the butterfly

Breast tenderloin - Boneless, skinless piece of breast meat

Wishbone - Breast portion containing the wishbone

Leg quarter - Drumstick, thigh, and back portion

Leg - Drumstick and thigh

Drumstick - Portion of the leg of a chicken below the knee joint

Thigh - Thigh of a chicken

Wing - Wing of a chicken

Drumette - Largest portion of the wing

Back - Backbone of a chicken

Liver, gizzard, heart and neck

Poultry Grading

All ready-to-cook poultry must be officially inspected to ensure that it is free from visible signs of disease before it can be quality graded. Ready-to-cook poultry can be graded by USDA graders, but grading is not required. If ready-to-cook poultry is graded by the official U.S. standards and grades, it assures consistency of quality from coast-to-coast and overseas. The standards and grades form a uniform yardstick or measure that describes the commercial quality of various products so their value, usage, and price can be determined.

Chickens, turkeys, ducks, geese, guineas, and pigeons are the classes of poultry covered by the "USDA Standards for Quality of Ready-to-Cook Poultry." The USDA has established standards for A, B, and C quality grades of poultry carcasses, parts, and individual units of poultry food products. The standards define and measure quality in terms of meat yield (fleshing), fat covering, and freedom from defects such as cuts and tears in the skin, broken bones, and discolorations on the meat and skin. The total area of the defects, their location, and number of defects are all considered in determining the grade. The final quality rating (A, B, or C) is based on the factor with the lowest rating. Carcasses, parts, or poultry food products found to be unsound, unwholesome, or otherwise unfit for human food in whole or in part, shall not be given any of the quality designations.

Ready-to-cook poultry is graded based on the following factors: conformation, fleshing, fat covering, defeathering, exposed flesh, discolorations, broken and disjointed bones, missing parts, and freezing defects. A detailed explanation of the factors for each grade is provided in the *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). The "Summary of Specifications for Standards of Quality for Individual Carcasses and Parts" from the USDA regulations for each grade are included in Figures 5.1, 5.2, and 5.3. Notice that the tables are not all inclusive. One would need to refer to the regulations for more details. Only a brief explanation of the factors follows.

Conformation is evaluated by judging the shape and appearance of the part or carcass. To what extent are there deformities such as a dented, curved or crooked breast, a crooked back, or misshapen legs or wings?

Fleshing is evaluated by judging the amount of flesh covering the carcass or part. The appropriate amount of flesh is dependant on the kind of poultry you are evaluating.

Figure 5.1 - Ready-to-Cook Poultry - A Quality

Ready-to-Cook Poultry - A Quality **Effective March 6, 1995**

Summary of Specifications for Standards of Quality for Individual Carcasses and Parts

(Not All Inclusive) (Minimum Requirements and Maximum Defects Permitted)

		A Quality				
Conformation:		Normal				
Breastbone		Slight curve or dent				
Back		Slight curve				
Legs and Wings		Normal				
Fleshing:		Well fleshed, considering kind and class				
Fat Covering:		Well developed layer -- especially between heavy feather tracts				
Defeathering:		Free				
Protruding pinfeathers, Diminutive feathers, and Hairs						
Exposed Flesh:[1]		**Carcass**		**Large Carcass Parts**[2] (halves, front and rear halves)		**Other Parts**[2]
Weight Range						
Minimum	Maximum	Breast and Legs	Elsewhere	Breast and Legs	Elsewhere	
None	2 lbs.	1/4 in.	1 in.	1/4 in.	1/2 in.	1/4 in.
Over 2 lbs.	6 lbs.	1/4 in.	1 1/2 in.	1/4 in.	3/4 in.	1/4 in.
Over 6 lbs.	16 lbs.	1/2 in.	2 in.	1/2 in.	1 in.	1/2 in.
Over 16 lbs.	None	1/2 in.	3 in.	1/2 in.	1 1/2 in.	1/2 in.
Discolorations:		**Lightly Shaded**			**Moderately Shaded**[3]	
Carcass		Breast and Legs	Elsewhere on carcass		Hock of leg	Elsewhere on carcass
None	2 lbs.	3/4 in.	1 1/4 in.		1/4 in.	5/8 in.
Over 2 lbs.	6 lbs.	1 in.	2 in.		1/2 in.	1 in.
Over 6 lbs.	16 lbs.	1 1/2 in.	2 1/2 in.		3/4 in.	1 1/4 in.
Over 16 lbs.	None	2 in.	3 in.		1 in.	1 1/2 in.
Discolorations:		**Lightly Shaded**			**Moderately Shaded**[3]	
Large Carcass Parts (halves, front and rear halves)		Breast and Legs	Elsewhere		Hock of leg	Elsewhere
None	2 lbs.	1/2 in.	1 in.		1/4 in.	1/2 in.
Over 2 lbs.	6 lbs.	3/4 in.	1 1/2 in.		3/8 in.	3/4 in.
Over 6 lbs.	16 lbs.	1 in.	2 in.		1/2 in.	1 in.
Over 16 lbs.	None	1 1/4 in.	2 1/2 in.		5/8 in.	1 1/4 in.
Discolorations: Other Parts		**Lightly Shaded**			**Moderately Shaded**[3]	
None	2 lbs.	1/2 in.			1/4 in.	
Over 2 lbs.	6 lbs.	3/4 in.			3/8 in.	
Over 6 lbs.	16 lbs.	1 in.			1/2 in.	
Over 16 lbs.	None	1 1/4 in.			5/8 in.	
Disjointed and Broken Bones:		Carcass--1 disjointed and no broken bones Parts--Thighs with back portion, legs, or leg quarters may have femur disjointed from the hip joint. Other parts--none.				
Missing Parts:		Wing tips and tail. In ducks and geese, the parts of the wing beyond the second joint may be removed if removed at the joint and both wings are so treated. Tail may be removed at base.				
Freezing Defects:		Slight darkening on back and drumstick. Overall bright appearance. Occasional pock marks due to drying. Occasional small areas of clear, pinkish, or reddish colored ice.				

[1]Maximum aggregate area of all exposed flesh. In addition, the carcass or part may have cuts or tears that do not expand or significantly expose flesh, provided the aggregate length of all such cuts does not exceed a length tolerance equal to the permitted dimensions listed above.

[2]For all parts, trimming of skin along the edge is allowed, provided at least 75 percent of the normal skin cover associated with the part remains attached, and the remaining skin uniformly covers the outer surface and does not detract from the appearance of part.

[3]Moderately shaded discolorations and discolorations due to flesh bruising are free of clots and limited to areas other than the breast and legs except for the area adjacent to the hock.

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

Figure 5.2 - Ready-to-Cook Poultry - B Quality

Ready-to-Cook Poultry - B Quality **Effective March 6, 1995**
Summary of Specifications for Standards of Quality for Individual Carcasses and Parts
(Not All Inclusive) (Minimum Requirements and Maximum Defects Permitted)

		B Quality	
Conformation: **Breastbone** **Back** **Legs and Wings**		Moderate deformities Moderately dented, curved, or crooked Moderately crooked Moderately misshapen	
Fleshing:		Moderately fleshed, considering kind and class	
Fat Covering:		Sufficient fat layer -- especially on breast and legs	
Defeathering: **Protruding pinfeathers, Diminutive feathers, and Hairs**		Few scattered	
Exposed flesh: Weight Range		**Carcass**	**Parts**
Minimum	Maximum		
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	No part on the carcass (wings, legs, entire back, or entire breast) has more than 1/3 of the flesh exposed	No more than 1/3 of flesh normally covered by skin exposed
Discolorations:[1] **Carcass**		**Carcass** Lightly or Moderately Shaded Discolorations	
		Breast and Legs	Elsewhere on Carcass
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	1 1/4 in. 2 in. 2 1/2 in. 3 in.	2 1/4 in. 3 in. 4 in. 5 in.
Discolorations:[1] **Large Carcass Parts** (halves, front and rear halves)		**Large Carcass Parts**	
		Breast and Legs	Elsewhere
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	1 in. 1 1/2 in. 2 in. 2 1/2 in.	1 1/4 in. 1 3/4 in. 2 1/2 in. 3 in.
Discolorations:[1] **Other Parts**		**Other Parts** Lightly or Moderately Shaded Discolorations Breasts, Legs, and Parts	
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	3/4 in. 1 in. 1 1/2 in. 1 3/4 in.	
Disjointed and Broken Bones:		Carcass--2 disjointed and no broken bones, or 1 disjointed and 1 nonprotruding broken bone Parts--may be disjointed, no broken bones; wing beyond second joint may be removed at a joint	
Missing Parts:		Wing tips, 2nd wing joint and tail.	
Trimming:		**Carcass**	**Parts**
		Slight trimming of the carcass is permitted provided the meat yield of any part on the carcass is not appreciably affected. The back may be trimmed in an area not wider than the base of the tail to the area halfway between the base of the tail and the hip joints.	A moderate amount of meat may be trimmed around the edge of a part to remove defects.
Freezing Defects:		May lack brightness. Few pockmarks due to drying. Moderate areas showing a layer of clear, pinkish, or reddish colored ice.	
[1]Discolorations due to flesh bruising shall be free of clots and may not exceed one-half the total aggregate area of permitted discoloration.			

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

Figure 5.3 - Ready-to-Cook Poultry - C Quality

Ready-to-Cook Poultry - C Quality **Effective March 6, 1995**
Summary of Specifications for Standards of Quality for Individual Carcasses and Parts
(Not All Inclusive) (Minimum Requirements and Maximum Defects Permitted)

		C Quality	
Conformation: **Breastbone** **Back** **Legs and Wings**		Abnormal Seriously curved or crooked Seriously crooked Misshapen	
Fleshing:		Poorly fleshed	
Fat Covering:		Lacking in fat covering over all parts of carcass	
Defeathering: **Protruding pinfeathers, Diminutive feathers, and Hairs**		Scattering	
Exposed Flesh: Weight Range		**Carcass**	**Parts**
Minimum	Maximum		
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	No limit	
Discolorations: **Carcass**		**Carcass**	
		Breast and Legs	Elsewhere on Carcass
None Over 2 lbs. Over 6 lbs. Over 16 lbs.	2 lbs. 6 lbs. 16 lbs. None	No limit on size, number of areas, or intensity of discolorations and flesh bruises if such areas do not render any part of the carcass unfit for food.	
Disjointed and Broken Bones:		No limit	
Missing Parts:		Wing tips, wings, and tails Backs shall include all meat and skin from the pelvic bones, except that the meat contained in the ilium (oyster) may be removed. The vertebral ribs and scapula with meat and skin and the backbone located anterior (forward) of the ilia bones may also be removed (front half of back).	
Trimming:		**Carcass**	**Parts**
		Trimming of the breast and legs is permitted, but not to the extent that the normal meat yield is materially affected. The back may be trimmed in an area not wider than the base of the tail to the area between the hip joints.	
Freezing Defects:		Numerous pockmarks and large dried areas	

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Voluntary Grading of Poultry Products and Rabbit Products and U.S. Classes, Standards, and Grades* (7 CFR Part 70). Washington, DC. Effective March 6, 1995.

When evaluating fat covering, the grader is looking at how well the fat is distributed over the carcass or part.

For the defeathering evaluation factor, the grader is looking for the presence of and number of protruding pinfeathers, small (diminutive) feathers, and hairs.

The grader evaluates the amount of exposed flesh (exposed meat) that is the result of cuts, tears, and missing skin. For each grade, the total area (aggregate area) of exposed meat must not equal more than the equivalent area of a circle as indicated by the diameters listed in the table. Notice that diameters vary depending on the size of the carcass and the part.

Discolorations pertain to the amount of bruising of the skin and flesh of poultry with skin and the flesh of skinless poultry. The amount of light to moderate discolorations allowable for the grade are provided in the tables. The total area (aggregate area) of discolorations must not equal more than the equivalent area of a circle as indicated by the diameters listed in the tables.

For the disjointed and broken bones and missing parts categories, the grader is evaluating the carcass or part for disjointed bones, broken bones, and missing parts. The criteria for each grade indicates what is the maximum number of defects allowed. For all grades, the wing tips may be removed at the joint, and the tail may be removed at the base. Grades B and C criteria also include the amount of trimming allowed.

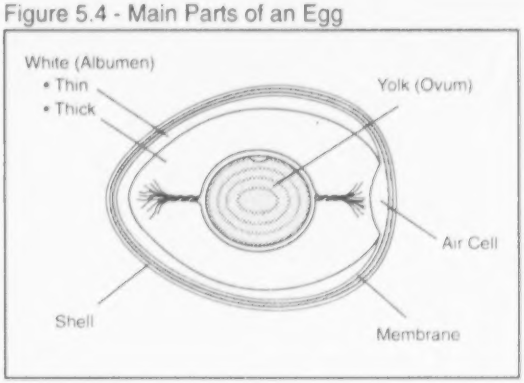
Freezing defects indicate the amount of allowable damage from handling or from freezing the packaged poultry, parts, or poultry food products.

Egg Grading

Just like ready-to-cook poultry products, quality grading is not required for individual shell eggs. The "United States Standards for Quality of Individual Shell Eggs" provide a consistent way to grade the quality of whole eggs from chickens. It does not apply to eggs from any other type of poultry or to eggs out of the shell. Only a summary of the standards is provided below. One would need to refer to the regulations for more details.

The standards spell out the specifications for four quality factors: shell, air cell, white, and yolk. Figure 5.4 indicates the main parts of an egg. The interior

Figure 5.4 - Main Parts of an Egg



egg specifications (air cell, white, and yolk) are based on the apparent condition of the interior contents of the egg as it is twirled before a candling light. For candling, the egg should be held between your thumb and first two fingers with the large end up. Turn your hand and wrist quickly in an 180° arc, which causes the inside of the egg to whirl. Quickly stop the turning motion and place the side of the egg next to the candling light with the large end up. If not candled this way, the air cell will not be visible. The movement, outline, and shape of the air cell, white, and yolk are evaluated as described below.

An egg is considered inedible if it has any type of rot, is moldy or musty, contains a blood ring or an embryo chick, or is adulterated (altered). An egg that is inedible, cooked, frozen, contaminated, or contains bloody whites, large blood spots, large unsightly meat spots, or other foreign material is considered a "loss." Eggs that are a loss are not eligible for a quality grade. Most eggs qualify for AA, A, or B qualities. For eggs with dirty or broken shells, the standards of quality provide two additional qualities: dirty and check. Dirty indicates that the unbroken shell has adhering dirt, prominent stains or moderate stains covering more than 1/32 of the shell surface if localized, or 1/16 of the shell surface if scattered. Check indicates that an egg has a broken shell or crack, but the shell membranes are intact and do not leak.

The shell is evaluated for its cleanliness, shape, texture, and thickness. A shell is considered *clean* if it is free from foreign material and stains that are readily visible. It may have small specks, stains, or cage marks if they do not detract from the generally clean appearance of the egg. *Practically normal* indicates that the shell is basically the usual shape and is sound and free from thin spots. Ridges and rough areas that do not significantly affect the shape

Figure 5.5 - Quality Standards for Individual Shell Eggs

SUMMARY OF U.S. STANDARDS FOR QUALITY OF INDIVIDUAL SHELL EGGS Specifications for Each Quality Factor			
Quality Factor	AA Quality	A Quality	B Quality
Shell	Clean. Unbroken. Practically normal.	Clean. Unbroken. Practically normal.	Clean to slightly stained.* Unbroken. Abnormal.
Air Cell	1/8 inch or less in depth. Unlimited movement and free or bubbly.	3/16 inch or less in depth. Unlimited movement and free or bubbly.	Over 3/16 inch in depth. Unlimited movement and free or bubbly.
White	Clear. Firm.	Clear. Reasonably firm.	Weak and watery. Small blood and meat spots present.**
Yolk	Outline slightly defined. Practically free from defects.	Outline fairly well defined. Practically free from defects.	Outline plainly visible. Enlarged and flattened. Clearly visible germ development but not blood. Other serious defects.
For eggs with dirty or broken shells, the standards of quality provide two additional qualities. They are:			
Dirty		Check	
Unbroken. Adhering dirt or foreign material, prominent stains, moderate stained areas in excess of B quality.		Broken or cracked shell but membranes intact, not leaking.***	
* Moderately stained areas permitted (1/32 of surface if localized, or 1/16 if scattered). ** If they are small (aggregating not more than 1/8 inch in diameter). ***Leaker has broken or cracked membranes, and contents leaking or free to leak.			

Credit: United States Department of Agriculture. Agricultural Marketing Services. Poultry Division. *Regulations Governing the Grading of Shell Eggs* (7 CFR Part 56) Effective May 1, 1997, and *United States Standards, Grades, and Weight Classes for Shell Eggs* (AMS 56) Effective April 6, 1995. Washington, DC.

and strength of the shell are permitted. *Abnormal* indicates that the shell is somewhat unusual or decidedly misshapen or faulty in soundness or strength or that it shows pronounced ridges or thin spots.

The air cell is evaluated for its depth and movement. The *depth of air cell* is the distance from the top of the air space to its bottom when the egg is held air cell upward, usually the large end of the egg. A *free air cell* indicates that the air cell moves freely toward the uppermost point in the egg as the egg is slowly rotated. A *bubbly air cell* indicates that the air cell has ruptured resulting in one or more small separate air bubbles.

The white is evaluated for its clarity, firmness, thickness, and presence of blood spots or meats. *Clear* indicates that the white is free from discolorations or from any foreign bodies floating in it. *Firm* indicates that the white is sufficiently thick to prevent the yolk outline from being more than

slightly defined when the egg is twirled. *Reasonably firm* indicates that the white is somewhat less thick than a firm white, which is indicated by the yolk outline being fairly well defined when the egg is twirled. The *weak and watery* statement indicates that the white is weak, thin, and generally lacking in thickness, which is indicated by the ability of the yolk to come close to the shell when the egg is twirled. *Blood spots and meats spots* indicate the presence of blood spots or meat spots not more than 1/8 inch in diameter. If they are larger or showing blood in the white, the egg is classified as loss. An egg with a *bloody white* has blood diffused through the white and is considered a loss. Eggs with blood spots which show a slight diffusion into the white around the localized spot are not to be classed as bloody whites.

Eight descriptive terms are used when evaluating the yolk. A yolk outline that is not distinct and appears to blend with the surrounding white as the egg is twirled is considered *outline slightly defined. Outline fairly well defined* indicates that the yolk outline is visible but not clearly outlined when the egg is twirled. If the yolk is clearly visible as a dark shadow when the egg is twirled, then it is classified as *outline plainly visible.* The yolk is considered *enlarged and flattened* when the yolk membranes and tissues have weakened and/or moisture has been absorbed from the white to such an extent that the yolk appears definitely enlarged and flat. *Practically free from defects* indicates that the yolk shows no germ development, but there may be slight defects on the yolk's surface. *Serious defects* indicates that the yolk shows well developed spots or areas and other serious defects which do not render the egg inedible. The development of the germ spot on the yolk of a fertile egg to the point where it is plainly visible as a definite circular area or spot with no blood in evidence is indicated by *clearly visible germ development.* When blood lines or a blood ring is present due to germ development, the egg is classified as inedible and is indicated as *blood due to germ development.*

The USDA Marketing Service has summarized the specifications for each quality factor as indicated in Figure 5.5.

Summary

Poultry carcasses are often cut into various parts before sale to consumers. Both carcasses and parts can be graded by the USDA, although grading is not required. When shell eggs are federally graded, the shell, air cell, white, and yolk are evaluated for quality.

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Along with beef, pork, lamb, and poultry, dairy products are a major agricultural food commodity in the United States. Raw milk is inspected and processed into fluid milk and other dairy products such as yogurt, ice cream, and various types of cheeses.

Milk Grades and Products

Raw milk can be one of two grades: grade A milk or manufacturing grade milk. Grade A milk is for drinking and is called fluid milk. Other dairy foods may be made from grade A milk. Grade A milk comes from grade A dairies which are required to meet more strict sanitation standards than are manufacturing grade dairies. All milk is tested periodically for bacteria count, somatic cell count, and antibiotics. Somatic cells are mostly white blood cells that the cow produces to fight infections. When the somatic cell count of milk is elevated, the cow is experiencing health problems in one or more of the four mammary glands. Grade A milk commands a higher price paid to producers than does manufacturing grade milk.

Manufacturing grade milk may be used only for manufactured dairy products such as butter, dry milk products, cheeses (except cottage in some markets), and frozen desserts (in most markets).

Milk Processing

Fluid milk is collected from the farm in a large insulated stainless steel "bulk" tank on a truck and is taken directly to a processing plant. At the processing plant, the milk is pasteurized and homogenized. Vitamin D must be added to all fluid milk, while vitamin A must be added to milk containing less than 3.25% milk fat, the legal minimum for any product that is labeled "milk." Below this limit, descriptors must be placed in front of the word milk. For example, milk containing 2% milk fat is called "reduced fat milk." Milk that provides less than 3 grams of fat per 8-ounce serving is known as "lowfat milk," and when 8 ounces contain less than 0.5 grams of fat, it is called "nonfat milk" or "skim milk."

Pasteurization involves heating milk above 161°F for over 15 seconds to kill bacteria and other disease-causing microorganisms.

Homogenization prevents the milk from separating into cream and skim milk during storage. The hot milk is pumped through a fine orifice (opening) under high pressure. This breaks down the milk fat globules, so they will be too small to separate from the skim milk.

Milk Defects Resulting in Off Flavors

Milk is naturally a slightly sweet, rather bland-tasting liquid; however, various factors sometimes create off flavors in milk. Off flavors resulting from milk defects are a major consumer concern. These off flavors, if not detected before reaching the consumer, lower the consumer appeal for milk and milk products. Some milk defects which result in off flavors of milk can make the milk unsaleable. Off flavors can be associated with the following.

Bitter - Bitterness usually results from the spoilage of milk by bacteria that grow at refrigerator temperatures. These psychrotrophic bacteria degrade milk proteins causing bitterness. A bitter taste makes the milk unsaleable.

Feed - One of the most common milk defects occurs when the feed flavor passes through the cow's bloodstream to the mammary glands, producing an off flavor in milk. Offending feeds and plants include silage, ryegrass, ragweed, and wild onions. These will cause the milk to taste similar to the smell of the feed the cow has consumed. Off flavor caused by feed does not affect the milk's saleability, but it reduces the flavor appeal.

Flat/watery - A flat or watery taste results when milk is diluted with water or when milk is very low in fat content. It does not affect the milk's saleability, but it reduces the flavor appeal and it is illegal to add water to milk.

Foreign - A foreign taste is present in milk that has come in contact with cleaners or sanitizers in inadequately drained equipment. This makes the milk unsaleable.

Malty - A malty taste results from milk that has been spoiled by an unusual type of bacteria. Infrequently, bromegrass pastures produce malty flavored milk. A malty taste will probably result in the milk being unsaleable depending on the cause of the malty flavor.

Oxidized - This "wet cardboard" or "metallic" taste results from milk being exposed to sunlight, copper, or iron. Milk that has been oxidized is usually not saleable.

Rancid - Rancid is also known as lipolyzed. A rancid flavor results from milk that has been allowed to become too warm and was not properly stored and/or cooled. Churning milk fat removes the protective fat globule membrane, allowing milk's natural lipase to split the fatty acids from the glycerol "backbone" of the milk fat. Rancid milk has a foul odor and taste resembling the smell of sweaty socks or blue cheese. Rancid milk is not saleable.

Salty - Salty milk originates from cows with mastitis, which is an infection in the cow's mammary system. With today's production practices, there are very few incidences of mastitis. Salty milk is saleable because the pasteurization process kills the bacteria that are present in the mastitis. However, this flavor may not be desired among consumers.

Sour - This acidic flavor is caused by the production of lactic acid by bacterial fermentation of milk's sugar, lactose. Sour milk is almost always caused by leaving the milk out at too high a temperature. Sour milk is not saleable.

Cheese Identification

Approximately 400 varieties of cheese are available for consumption. Several popular and distinct varieties are discussed below. Cheeses differ in appearance, color, flavor, and texture. Most are made from cow's milk. When a cheese is typically made from milk of another species, it is noted in the discussion.

Blue - Blue cheese is a semisoft, mold-ripened cheese. It has a white interior with strips of blue *Penicillium* mold running through the cheese. Blue cheese exhibits a peppery taste and a pungent aroma. In France this general class of cheeses is known as Fromage Bleu. Many countries have their own name(s) for blue cheeses, for example Gorganzola in Italy and Stilton in Great Britain. Roquefort cheese looks like blue cheese but is made from ewe's milk in a specific region of France.

Brick - Brick cheese is semisoft, mild to medium-strong in flavor, smooth and waxy in texture, yellow in color, and has small openings throughout. Traditionally, Brick cheese is surface-ripened, but some markets require a delicate flavor that is achieved without the surface microflora.

Brie/Camembert - Brie/Camembert cheese is a very soft cheese variety with a thin crust that contains microorganisms that aid in ripening the cheese. It has a mild to pungent flavor.

Cheddar - Cheddar cheese is the most popular cheese in the United States. The intensity of the yellow color depends on how much coloring is added. Mild Cheddar is aged for a shorter period of time than medium and sharp Cheddar. Cheddar cheese has a nut-like flavor and has a firm but smooth texture. Openings that may exist in it are irregular in shape, unless undesirable bacteria produce gas that forms round holes or until undesirable yeasts form slits.

Colby - Colby is a yellow cheese that is softer than Cheddar and has many small irregular openings. Because it is aged only 1 to 3 months, it has a mild and slightly sour flavor.

Cottage - Unripened curd is made from skim milk. Cream, salt, and stabilizer are added to make the creamed form of this soft product, which contains 4% milk fat and 20% total solids. It is also made in reduced fat, lowfat, and nonfat varieties. The curds are cut into cubes that range in size from 0.2 to 0.5 inches.

Cream - This is a soft, white, buttery, smooth, spreadable cheese made by concentrating acidified cream. It is served fresh without ripening. The flavor is nut-like and slightly sour.

Gouda/Edam - Gouda and Edam cheeses originated in Holland. They are similar to Cheddar in taste. Gouda and Edam are less sour, however, because they are made with a high concentration of the coagulating enzyme, rennin or chymosin. These cheeses are traditionally covered with wax coatings and are formed in ball or wheel shapes. Gouda and Edam contain round openings throughout, which are caused by gas from friendly ripening bacteria that produce a nutty flavor.

Monterey Jack - This white to light yellow (no color added) cheese has many small holes. It is similar to Colby but softer.

Mozzarella - This white, very stringy, or plastic, cheese is used primarily on pizzas. After curd is produced similar to Cheddar cheese, the pressed curd is submerged in hot water and stretched. This removes much of the acid and causes the proteins to form polymers that provide the stretchy consistency of the melted cheese. This also makes

the flavor somewhat bland. Salt is added by soaking the formed loaves of curd in cold salt brine.

Munster (Muenster) - This semi-soft, yellow to white cheese originated in Germany. It is similar to brick cheese but has less of a surface layer of microorganisms and undergoes less ripening. It contains numerous small irregularly shaped openings and has a mild to mellow butternut flavor.

Pasteurized Process American - This is a yellow to white group of cheeses that can be made from several varieties of natural cheese including Cheddar, Colby, stirred curd, and washed curd. Both fresh, or green, curds and ripened cheeses are shredded and ground together and melted in a cooker. To this mixture emulsifier salts are added and mixed. The hot molten cheese is pressed onto cooling belts to make slices or into wrappers to make loaves. The process adds some cooked flavor, the emulsifier salts provide saltiness, and the cheeses provide characteristic flavors blended to maintain consistency from batch to batch. The cheese is usually free of holes provided air bubbles are eliminated, and it stores exceptionally well because enzymes and bacteria are inactivated by the process.

Provolone - This yellow to white colored, hard Italian cheese typically is highly aromatic, has a spicy flavor, and may have a smokey and/or salty taste. Being of the Pasta Filata (plastic curd) family, it has been stretched under hot water and has a stringy consistency similar to mozzarella cheese when warmed. Typically, provolone cheeses are formed into pear shapes and encased with twine or rope.

Swiss - Swiss cheese is hard, yellow to white in color, and filled with large openings (gas holes) produced by the ripening bacteria that impart the sweet, nut-like flavor.

Summary

Milk is graded differently from other raw animal products. Whereas, each egg, broiler, pig, and steer is examined for quality and safety, milk is graded based on inspections of farms and processing facilities and by periodic testing of milk. All fluid milk comes from grade A dairies. Milk is pasteurized and homogenized, and vitamins are added at the dairy plant. Dairy producers and processors must be careful not to contaminate milk with foreign material or to allow off flavors to develop. Various cheeses can be identified by using taste, sight, and smell.

Credits

Martin, Phillip. *Food Science and Technology*. University of Missouri-Columbia: Instructional Materials Laboratory, 1994.